NAVSEA OP 1667

JAPANESE EXPLOSIVE ORDNANCE

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ORDNANCE PAMPHLET 1667

JAPANESE EXPLOSIVE ORDNANCE

1. Ordnance Pamphlet 1667 describes and illustrates Japanese explosive ordnance. It covers bombs, bomb fuzes, land mines, grenades, firing devices, sabotage devices, and ammunition.

2. Ordnance Pamphlet 1667 is intended to provide general descriptions of these fields of ordnance for instructional and informational purposes.

3. This publication supersedes the publications on Japanese explosive ordnance issued by the United States Navy Bomb Disposal School, which should be destroyed.

G. F. Hussey Jr.

G. F. Hussey, Jr.,
Vice Admiral, U. S. Navy,
Chief of the Bureau of Ordnance.

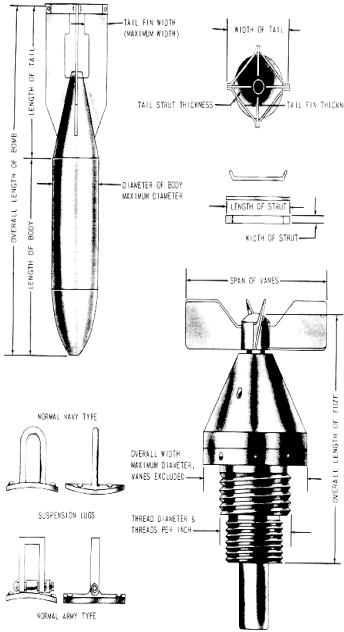


Figure 1—Definitions of Terminology.

JAPANESE AMMUNITION—EXPLANATORY NOTES

Japanese Weapons

1. The bore diameter of Japanese Army weapons measures an even number of millimeters (metric system). However, the guns are designated by their nominal sizes, usually to the nearest even centimeter.

2. The bore diameter of Japanese Navy weapons quite often measures to an even inch in keeping with the English system, though some common Navy guns are designed with a bore diameter in an even number of millimeters. The Navy also designates its guns by nominal sizes, usually to the nearest even centimeter.

3. To avoid confusion, ammunition is classified in this book by the nominal bore size of the weapon according to the Japanese nomenclature with the actual size given in parenthesis. In Navy ammunition above 5-cm. the actual size is given in both metric and English measurement.

4. Both services designate the size of guns under 5-cm by the actual size in millimeters, e. g. 47-mm, 40-mm, 30-mm, 20-mm.

Classification of Projectiles

1. Army Projectiles

The Japanese nomenclature for projectiles is followed as far as practicable. The Japanese Army terminology is self-explanatory and conforms fairly well with U. S. custom.

Needing some explanation are the terms A. P. and A. P.-H. E.

A. P. indicates a projectile intended for piercing heavy armor, for example, armor plate of thickness equal to or greater than the caliber of the projectile. These projectiles have an H. E. bursting charge.

A. P.-H. E. indicates a solid-nosed projectile in general similar to the A. P. but designed for much lighter penetration. These carry an H. E. charge approaching that of a standard H. E. projectile. Hence, the term A. P.-H. E. is intended to indicate its intermediate status between an H. E. projectile and a heavy armor-piercing projectile. A. P.-H. E. projectiles are painted like H. E. projectiles but obviously they may be differentiated by their form.

2. Navy Projectiles

The classification and designation of Navy projectiles by the Japanese is highly irregular and cumbersome. Complete and accurate identification of a projectile requires identification of the gun, descriptive nomenclature of the projectile, and mark (or type) and modification number.

Example: 14 cm/50 Ordinary
(Gun) (General type of projectile)
Type 0
(Design number)

For this reason an arbitrary system of nomenclature is used in this book. Japanese Navy nomenclature is given as a sub-title where known.

In Japanese Navy nomenclature all projectiles with a relatively high explosive charge (including light armor-piercing types) are designated TSUJODAN, which may be translated either "Ordinary Projectile" or "Common Projectile." Since this is a composite group including standard high explosive projectiles as well as light penetrating types, the translation "Ordinary" is used in this book for Japanese designations and the term "Common" is reserved for specific use as a descriptive title for light penetrating types of projectile (solid nose, base-fuzed) in accordance with the U. S. meaning of "Common." Projectiles having a point detonating fuze are designated "High Explosive" to conform with U. S. terminology.

Abbreviations

The following abbreviations will be used in this section:

A. A. M. G.	Antiaircraft Machine Gun.
A. C.	Aircraft Cannon.
A. C. M. G.	Aircraft Machine Gun.
A. P.	Armor-Piercing.
A. P. I.	Armor-Piercing Incendiary.
A. P. T.	Armor-Piercing Tracer.
A. TK.	Anti-tank.
H. E.	High-Explosive.
H. E A. T.	High-Explosive Anti-tank (Hollow Charge).
H. E. I.	High-Explosive Incendiary.
H. E. I. T.	High-Explosive Incendiary Tracer.
H. E. T.	High-Explosive Tracer.
H. M. G.	Heavy Machine Gun.
I.	Incendiary.
I. T.	Incendiary Tracer.
L. M. G.	Light Machine Gun.
MK	Mark.
MOD	Modification.
S. D.	Self-Destroying.
TK.	Tank.
W. P.	White Phosphorus.

Chapter 1

JAPANESE BOMBS

Introduction

The contents of this section are divided into two main parts, Japanese Army bombs and Japanese Navy bombs.

The Japanese Army and Navy have separate air forces each of which employs its own distinct types of bombs and fuzes. These ordnance items are dissimilar in construction and identification features, and each service utilizes its own system of designation.

For the most part the two types of bombs and fuzes may not be used interchangeably. Special adapters have been developed, however, which allow some flexibility of this rule. This has been particularly demonstrated in the use of Navy bombs by the Army in conducting antisubmarine warfare.

The Japanese designations of bombs are used in this book. A general discussion of the system is presented here. A more detailed explanation is given in the introduction to each section.

System of designation:

1. *Type number.*—Items of ordnance, as well as most other items of military equipment, are given a type number indicating the year the article was finally adopted for service use. This may occur several years after the ordnance has been in production and actual use.

Until the reign of the present emperor, (Showa era; started in 1926) items were designated by the year of era. Now, however, the year of the Japanese Empire (Japanese year 2600 corresponds to our 1940) may be used. For items introduced up to the year 2600 the last two numbers are used in the designation. Thus type 99 means the item was adopted in 2599 or our 1939.

The year 2600 may be represented as type 100 or type 0, in a designation. The years 2601, 2602, etc., are usually represent by the last digit such as type 1, type 2, etc.

Experimental Ordnance items are assigned experimental type numbers indicating the year of the Showa era during which the experiment was authorized.

Ordnance items standardized in the eras preceding the Showa era; namely, Taisho 1912–1926 and Meiji 1867–1912, will be designated by the era and the year of the era. Type II (Taisho) = 1922, type 41 (Meiji) = 1908.

2. *Mark number.*—Some ordnance such as Navy bombs developed for a special purpose will be designated by a mark number.

3. *Description of ordnance.*—Some items may have a word or two following the type number which gives a brief description of the particular piece of ordnance.

4. *Model.*—This term has several meanings but generally it indicates a change in basic design.

5. *Modification.*—This is used to represent minor changes in design or a change in explosive filling.

Chapter 1—Section 1

JAPANESE ARMY BOMBS

1. Designation

The Japanese Army designates its bombs according to a type number, weight, and sometimes a descriptive title.

a. The type number indicates the year in which the bomb was adopted for service use.

b. The weight is expressed in kilograms and usually is stenciled on the bomb.

c. The descriptive title is not used on the standard high-explosive bombs but is used on others. The descriptive title such as smoke,

ARMY EXPLOSIVES

Explosive	Use	Japanese Designation	Remarks
Primers (cap composition):			
1. Mercury fulminate, potassium chlorate, antimony trisulfide.	Primer cap composition.	Bakufun=exploding powder.	Documents: Mks I and III are ammunition primers, Mk II is a fuze primer.
2. Potassium chlorate, antimony sulfide.	Primer cap composition.		Most common mixture for fuze primers.
Initiators (detonators):			
3. Mercury fulminate	Initiator for fuzes and blasting caps.	Raikō=thunder mercury	
4. Lead azide	Initiator for fuzes and detonators.	Chikka Namari	Most common initiator especially where a black powder relay is present.
Boosters:			
5. Picric acid	Main booster charge	Ōshokuyaku=yellow color explosive.	Pressed. Toxic.
6. Tetryl	Subbooster	Meisyaku	Pressed. Toxic.
7. RDX	Subbooster	Shouyaku	Pressed (often with wax).
Main charges:			
8. Picric acid	Bombs, projectiles, land mines, bangalore torpedo.	Yellow color explosive	Usually cast in preformed paper-wrapped blocks. Toxic.
9. TNT	Bombs (rare) projectiles, hand grenades.	Chakatusuyaku=tea-brown explosive.	Generally cast into case. Granular in grenades. Toxic.
10. TNT, 25 percent; Picric, 75 percent.	Bombs	Chaōyaku=TNT-picric.	Cast—rare. Documents: TNT lowers melting point and facilitates casting. A bit less sensitive than picric. Toxic.
11. Picric, 50 percent; Dinitronaphthalene, 50 percent.	Projectiles	Ōnayaku	Cast—rare. Documents: Picric 80 percent, Dinitronapthalene 20 percent. Dinitronaphthalene aids casting and makes less sensitive. Toxic.
12. Picric, 90 percent; Wax, 10 percent.	Projectiles	Ōshivaku=picric wax	Pressed. Used in nose of A. P. projectiles. Documents: low sensitivity. Toxic.
13. TNT, 70 percent; Dinitronaphthalene, 30 percent.	Projectiles	Chanayaku	Cast. Toxic.
14. TNT 70, 60, and 50 percent; RDX 30, 40, and 50 percent.	Bombs, projectiles, land mines, bangalore.	Nigo tanōyaku=Mk 2 pale yellow explosive.	Cast. Appears to be the coming Army explosive. Many new types of ordnance have it. Toxic.
15. Ammonium nitrate, 75 percent; RDX, 25 percent.	Bombs	Anga yaku	Cast in case. White and very hygroscopic.

incendiary, gas, substitute, practice, and antishipping, indicate the purpose of the bomb.

2. Construction

The standard high-explosive bombs are of three-piece construction. On older bombs the tail cone, which is filled with explosive, is welded to the cylindrical body, and the nose section is threaded to the body. In later models the nose is welded to the body and the tail cone is threaded on.

Some of the antishipping bombs utilize two-piece construction; the nose and body are of one piece, and the tail cone is threaded to the body. The special construction features of the various antishipping bombs are described under the individual bombs.

3. Suspension

All the Army bombs except those carried in containers are suspended by a single hinged rectangular lug located at the center of gravity.

4. Filling

High-explosive bombs are usually filled with precast, paper-wrapped blocks of explosive surrounded by paraffin, or in the latest type by cast TNT. When fillings other than picric acid are used, the nature of the filling may be stenciled on the bomb. Bombs filled with an explosive other than the standard filling for that bomb are marked with the Jap character for "special."

5. Color and markings

High-explosive bombs are painted black over-all. A red band around the tip of the nose indicates that the explosive is loaded in the bomb case. A white band forward of the suspension lug indicates that the bomb case is made of high-grade steel. A yellow band forward of the white band denotes a high-explosive filling. Recently this system has been modified to the extent that the white band has been omitted. Forward of the yellow band is stenciled the type number, weight, filling, and additional description. Aft of the suspension lug is stenciled the place and the date of manufacture and a "+" or "−" indicating a minor weight discrepancy.

Incendiary bombs with a solid filling are painted black over-all with a white band forward of the suspension lug.

A symbol for incendiary bombs " ヤ " is stenciled on the bomb.

All liquid-filled bombs are painted grey over-all. A red nose tip indicates that the high explosive burster tube is loaded and a blue band aft of the nose tip indicates that the liquid filling is present.

Liquid-filled incendiary bombs are marked by a single white band just forward of the suspension lug and by the symbol " ヤ "

Liquid-filled smoke bombs are grey over-all, have a red nose band and no body band. They are marked by the symbol for smoke " T "

Gas bombs are painted grey over-all and have a red nose band. It is supposed that color bands around the body indicate the type of gas filling. This system is utilized in marking Army gas projectiles.

Red band	Vomit gas.
Blue band	Lung irritant.
Green band	Tear gas.
Yellow band	Vesicant.
Brown band	Blood and nerve poison.

6. Sizes

Although documents refer to 1,000-kg. bombs, none larger than 500-kg. has been recovered.

7. Fuzing

All Army bombs of 30-kg. and above may be fuzed in both the nose and tail. Bombs of 250-and 500-kg. generally use larger weight.

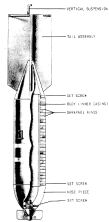


Figure 2—Type 92 15-kg. High-Explosive Bomb.

Type 92 15-kg. High-Explosive Bomb

Fuzes.....A–2 (b), A–2 (d)
Over-all length: 25⅛ inches.
Length of body: 14⅛ inches.
Diameter of body: 3⅞ inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel rings (26).
Type of Suspension: Vertical and horizontal.
Suspension lug: Normal Army suspension lug. Rectangular hinged steel lug on a plate riveted to body with four rivets. A similar steel hinged lug is fastened to end of tail fins.
Color and markings: Black over all with a red band around the nose and a white band and yellow band forward of the suspension lug. (White band may be missing.)
Length of tail: 11 inches.
Width of tail: 5½ inches.
Width of tail fins: 2¾ inches.
Dimensions of tail struts: Length, 3¾ inches; width, 5/16 inch; thickness, 1/16 inch.
Material of tail: 1/16-inch sheet steel.
Type of filling: 3 precast blocks of picric acid. An alternative filling is cast TNT.
Weight of filling: 9 pounds 9 ounces.

Total weight of bomb: 33 pounds.
Charge/weight ratio: 30 percent.

Construction of body: A cast-steel nose is threaded onto a tubular steel body. Twenty-six steel rings ⅝ inch wide and ⅜ inch thick are fitted around the body. One ring to which the suspension lug is attached is 1⅜ inch wide and ⅜ inch thick. A tail cone is screwed onto the after end of the tubular body.

Construction of tail: Four angular fins are welded to the tail cone and braced by a single set of box-type struts. A suspension lug is secured to the after end of the fins.

Type 99 30-kg. High-Explosive Bomb

Fuzes. A–2 (a), A–2 (c); B–1 (a), B–1 (b); D–5 (a).
Over-all length: 33¼ inches.
Length of body: 19¾ inches.
Diameter of body: 5⅛ inches.
Thickness of wall: 9/32 inches.
Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army suspension lug.
Color and marking: Black over all with a red band around the nose and a yellow band and white band around the body forward of the suspension lug.
Length of tail: 13½ inches.
Width of tail: 8¼ inches.
Width of tail fins: 3¼ inches.
Dimensions of tail struts: Length, 5¾ inches; width, 1 inch; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: Cyclonite, 48 percent; TNT, 52 percent in 3 preformed blocks.
Weight of filling: 25 pounds, 12 ounces.
Total weight of bomb: 66 pounds.
Charge/weight ratio: 39 percent.

Construction of body: A cast-steel nosepiece is screwed into a tubular steel body. A tail cone is welded to the after end of the steel body.

Construction of tail: Four tail fins are spot welded to the cone, and are braced by a single set of box-type struts.

Remarks: This bomb has been found with sheet steel plates welded to the outer edges of the fins to form a box-like reinforcement for the tail fins. They cover the area from the after end of the fins to a point just forward of the curve in the fins. This is an antishipping adaptation using the A–8 (a) and B–8 (a) fuzes. Documents report that an antipenetration device is used on the tail of the type 99 30-kg. bomb for minimum altitude bombing.

Type 94 50-kg. Type 94 and Type 3 100-kg. High-Explosive Bombs

Fuzes: A–2 (a), A–2 (b), A–2 (c); B–1 (a), B–1 (b); D–5 (a).

	50 kg.	**100 kg.**
Over-all length	41 inches	53 inches.
Length of body	24½ inches	31¼ inches.
Diameter of body	7 inches	9½ inches.
Thickness of wall	¼ inch	13/32 inch.

Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army suspension lug.

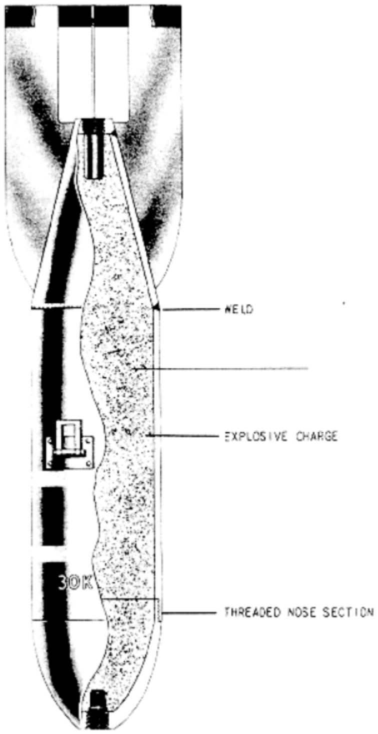


Figure 3—Type 99 30-kg. High-Explosive Bomb.

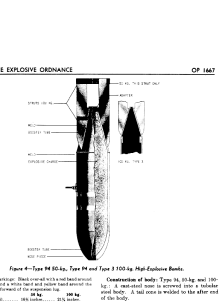


Figure 4—Type 94 50-kg., Type 94 and Type 3 100-kg. High-Explosive Bombs.

Color and markings: Black over-all with a red band around the nose and a white band and yellow band around the body just forward of the suspension lug.

	50 kg.	**100 kg.**
Length of tail	16 5/8 inches	21 1/4 inches.
Width of tail	9 1/2 inches	13 1/4 inches.
Width of tail fins	3 1/2 inches	5 7/16 inches.
Dimentions of tail struts.	6 1/8 x 1 9/16 x 5/32 inches.	Forward struts: 9 7/16 x 1 1/16 x 3/32 inches.. After struts: 9 7/16 x 1 9/16 x 3/32 inches.
Material of tail	Sheet steel	Sheet steel.
Type of filling	3 blocks of picric acid.	Type 94: 4 blocks of picric acid. Type 3: 5 blocks of picric acid.
Weight of filling	44 pounds	97 pounds 12 ounces.
Total weight of bomb.	110 pounds	220 pounds.
Charge/weight ratio	40 percent	42.5 percent.

Construction of body: Type 94, 50-kg. and 100-kg.: A cast-steel nose is screwed into a tubular steel body. A tail cone is welded to the after end of the body.

Type 3, 100-kg.: A cast steel nosepiece is welded to a tubular-steel body. A tail cone is welded to a collar which is screwed into the after end of the body.

Construction of tail: Four tail fins are spot welded to the tail cone and are braced by box type struts. The 50-kg. bomb has a single set of struts. The 100-kg. bomb has two sets of struts.

Remarks: The type 94, 100-kg. bomb may vary in its explosive filling: Variations include: (1) Picric acid, 78 percent; TNT, 22 percent in 4 preformed blocks. (2) Ammonium nitrate, 78 percent; RDX, 22 percent cast into the bomb.

Type 94 Modified and Type 1 50-kg. and 100-kg. H. E. Bombs

Fuzes.... Type 94, Modified, C–3(a), B–1(a), B–1(b);
Type 1, C–3(a), E–1(a).

	50 kg.	**100 kg.**
Over-all length	40 inch	52 inch.
Length of body	23¼ inch	30¼ inch.
Diameter of body	7⅛ inch	9½ inch.
Thickness of wall	5/32 inch	11/32 inch.
Material of wall	Tubular steel.	
Type of suspension	Horizontal.	

Suspension lug: Normal Army type suspension lug.

Color and markings: Black over-all and a red band around the nose. One yellow and one white band are forward of the suspension lug.

	50 kg.	**100 kg.**
Length of tail	16⅝ inch	21¾ inch.
Width of tail	9¾ inch	13⅝ inch.
Width of tail fins	3⁵⁄₁₆ inch	5⅛ inch.
Dimensions of tail struts.	6⅝ x 1⁹⁄₁₆ x ³⁄₃₂ inch.	Forward: 9⅞ x 1³⁄₁₆ x ³⁄₃₂ inch. After: 9⁷⁄₁₆ x 1³⁄₁₆ x ³⁄₃₂ inch.
Material of tail	Sheet steel	Sheet steel.
Type of filling	3 blocks of picric acid.	4 blocks of picric acid.
Weight of filling	44 pounds	103 pounds.
Total weight of bomb	110 pounds	237 pounds.
Charge weight ratio	40 percent	43.6 percent.

Construction of body: A cast-steel nosepiece is screwed into a tubular-steel body. The orifice in the nose measures 3 inches in diameter. A tail cone is welded to the after end of the body. A fuze adapter is welded onto the apex of the cone.

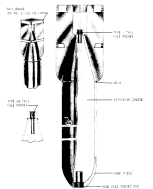


Figure 5—Type 94 Modified and Type 1 50-kg. and 100-kg. High-Explosive Bombs.

Type 94, Modified, tail fuze pocket is completely threaded.

Type 1 tail fuze pocket has three threads and then an annular groove.

Construction of tail: Four fins are welded to the tail cone and braced by box-type struts, a single set for 50-kg. bombs and a double set for 100-kg. bombs. A tail brake is fitted to the after end of the tail of the bombs.

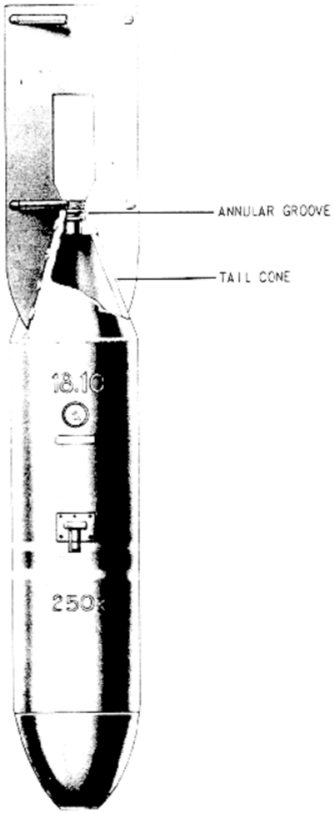


Figure 6—Type 1 250-kg. High-Explosive Bomb.

Type 1 250-kg. High-Explosive Bomb

Fuzes: C–3 (a), E–1 (a).
Over-all length: 75¼ inches.
Length of body: 45¼ inches.
Diameter of body: 11¾ inches.
Thickness of wall: ¼ inch.
Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type.
Color and markings: Black over-all. One yellow and one white band (⅞ inch) forward of suspension lug, 1 inch red band on tip of nose.
Length of tail: 30 inches.
Width of tail: 16½ inches.
Width of tail fins: 8¼ inches.
Dimensions of tail struts: Length 11 inches; width ⅝ inch; thickness 1/16 inch.
Material of tail: Steel.
Type of filling: Preformed, paper-wrapped, paraffin sealed picric acid blocks.
Weight of filling: 227 pounds.
Total weight of bomb: 550 pounds.
Charge/weight ratio: 43 percent.

Construction of body: A cast-steel nosepiece is screwed into a tubular-steel body. The tail cone is welded to the after end of the body. The nose piece has a 3-inch orifice to accommodate the C–3 (a) time fuze.

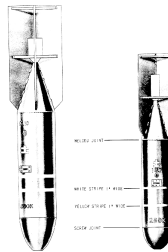
Construction of tail: Four fins are welded to the tail cone and braced by two sets of box-type struts. A fuze adapter is welded at the apex of the tail cone. The tail fuze pocket has three threads and then an annular groove.

Type 92 250-kg. and 500-kg. High-Explosive Bombs

Fuzes: A–4 (a); B–4 (a).

	250 kg.	**500 kg.**
Over-all length	76 inches	99¾ inches.
Length of body	46 inches	57½ inches.
Diameter of body	11¾ inches	15 inches.
Thickness of wall	¼ inch	5/16 inch.

Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type.
Color and markings: Black over all with a red tipped nose and one yellow and one white band forward of suspension lug.



TYPE 92 500 KG.

TYPE 92 250 KG.

Figure 7—Type 92 250-kg. and 500-kg. High-Explosive Bombs.

	250 kg.	**500 kg.**
Length of tail	30 inches	43¼ inches.
Width of tail	16½ inches	20¾ inches.
Width of tail fins	8¼ inches	10¾ inches.

Dimensions of tail struts: Length 11 inches; width, ⅝ inches; thickness 1/16 inch.

Material of tail: Steel.

Type of filling: Preformed blocks of picric acid.

	250 kg.	**500 kg.**
Weight of filling	230 pounds	491 pounds.
Total weight of bomb	550 pounds	1,100 pounds.
Charge/weight ratio	43 percent	46.4 percent.

Construction of body: A cast-steel nosepiece is threaded into a tubular-steel body. A tail cone is welded to the after end of the body.

Construction of tail: Four fins are welded to the tail cone and braced by two sets of box type struts. The tail fins of the 500 kg. are similar to the Navy bombs in that they are angled on the outer edge, as compared to the characteristic curve on the fins of Army 30-kg. to 250-kg. high-explosive bombs.

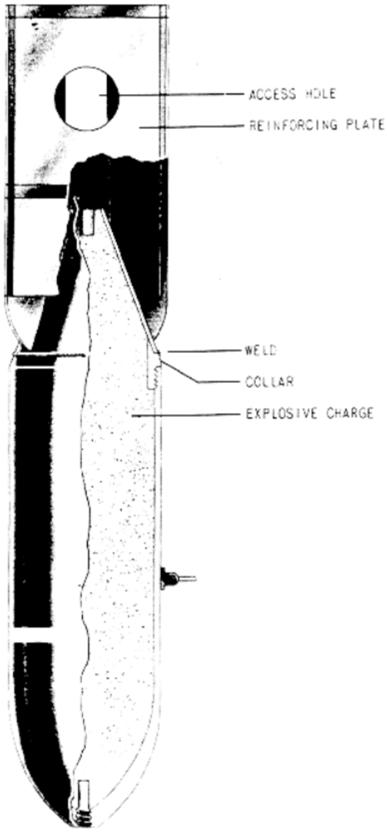


Figure 8—Type 3 100-kg. Skipping Model Bomb.

Type 3 100-kg. Skipping Model Bomb

Fuzes: A–8 (a); B–8 (a).
Over-all length: 53 inches.
Length of body: 31¼ inches.
Diameter of body: 9½ inches.
Thickness of wall: ⅜ inch.
Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type hinged suspension lug.
Color and markings: Black over-all with a red-tipped nose and a yellow band forward of the suspension lug.
Length of tail: 21¾ inches.
Width of tail: 13¾ inches.
Width of tail fins: $5\frac{7}{16}$ inches.
Dimensions of tail struts: Forward struts: $9\frac{7}{16}$ x $1\frac{3}{16}$ x $\frac{3}{32}$ inches. After struts: $9\frac{7}{16}$ x $1\frac{9}{16}$ x $\frac{3}{32}$ inches.
Material of tail: Steel.
Type of filling: Paper wrapped cast picric blocks sealed with TNT.
Weight of filling: 98 pounds.
Total weight of bomb: 220 pounds.
Charge/weight ratio: 42.5 percent.

Construction of body: The nosepiece and body are constructed of one piece of machined tubular steel. The after end of the barrel is threaded internally to receive the tail assembly. The tail cone is welded to a collar which screws into the after end of the barrel.

Construction of tail: Four tail fins are spot welded to the tail cone. They are braced by two sets of box-type struts. The tail fins are further strengthened by four steel plates welded to the outer edges and running the entire length from the after end to the curved portion of the fins. A round hole is cut in each plate to permit access to the tail fuze pocket.

Remarks: Recent specimens of this bomb incorporate a steel reinforcing section in the after end of the body. This cylindrical section closed at one end by a perforated plate is strengthened by three strips of metal which divide it into six equal compartments. Twelve hexagonal bolts around the outer circumference of the bomb hold the section in place. TNT is cast into the section to a point flush with its after edges.

Type 3 250-kg. Skipping Model Bomb

Fuzes: A–8 (b); B–8 (a).
Over-all length: 78 inches.
Length of body: 46½ inches.
Diameter of body: 11¾ inches.
Thickness of wall: ½ inches.
Material of wall: Tubular steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type suspension lug.
Color and markings: Black over all with a red-tipped nose and a yellow band forward of the suspension lug.
Length of tail: 31½ inches.
Width of tail: 16½ inches.
Width of tail fins: 8¼ inches.
Dimensions of tail struts: Length, 11½ inches; width, ¾ inch; thickness, 3/32 inch.
Material of tail: Steel.
Type of filling: Paper wrapped cast picric blocks sealed with TNT.
Weight of filling: 230 pounds.
Total weight of bomb: 550 pounds.
Charge weight ratio: 41 percent.

Construction of body: A steel nosepiece is welded to a tubular-steel barrel. The after end of the barrel is threaded internally to receive the tail assembly. A row of 12 hexagonal bolts around the circumference of bomb 3½ inches forward of the after end of the barrel hold a steel reinforcing section in place. This cylindrical section closed at one end by a perforated plate is strengthened by three strips of metal which divide it into six equal compartments. Twelve holes are drilled in the outer circumference of the section to accommodate the bolts. TNT is cast in the section to a point flush with its after edges. The tail cone is welded to a collar which screws into the after end of the barrel.

Construction of tail: Four tail fins are spot welded to the tail cone. They are braced by a single set of box-type struts. The tail fins are further strengthened by four steel plates welded to the outer edges and running the entire length from the after end to a point just forward of the curved portion of the fins. A square hole is cut in each plate to permit access to the tail fuze pocket.

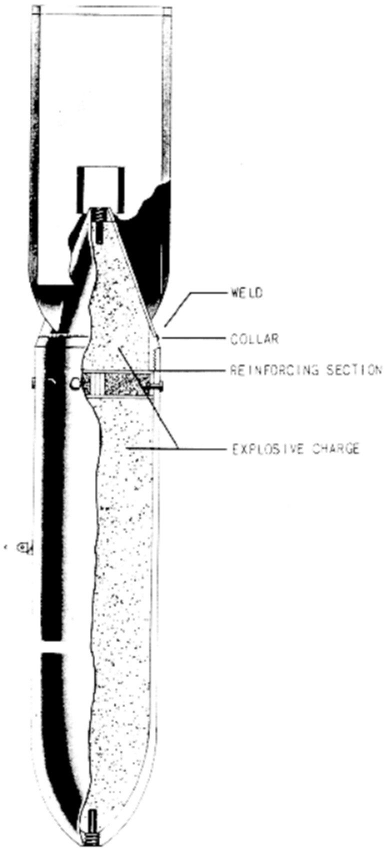


Figure 9—Type 3 250-kg. Skipping Model Bomb.

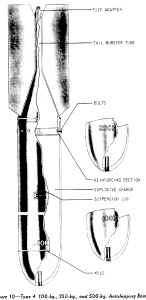


Figure 10—Type 4 100-kg., 250-kg., and 500-kg. Antishipping Bombs.

Type 4 100-kg., 250-kg. and 500-kg. Anti-Shipping Bombs

	100 kg.	**250 kg.**	**500 kg.**
Fuzes:	A–8 (a) B–8 (a)	A–8 (b) B–8 (a)	A–8 (b). B–8 (a).
Over-all length	53¼ inches	77¼ inches	99½ inches.
Length of body	31¼ inches	46½ inches	57½ inches.
Diameter of body	9½ inches	11¾ inches	15 inches.
Thickness of wall	⅜ inch	¼ inch	½ inch.

Material of wall: Tubular steel.

Type of suspension: Horizontal.

Suspension lug: Normal Army suspension lug.

Color and marking: Black over-all with a red-tipped nose and a yellow band forward of the suspension lug.

	100 kg.	**250 kg.**	**500 kg.**
Length of tail	22 inches	29¾ inches	42 inches.
Width of tail	13¼ inches	16¾ inches	20¾ inches.
Width of tail fins	6 inches	6¾ inches	8¾ inches.
Dimensions of tail struts	None	None	None.

Material of tail: Sheet steel.

Type of filling: Paper-wrapped, cast picric blocks sealed with TNT.

	100 kg.	**250 kg.**	**500 kg.**
Weight of filling		208 pounds	535.5 pounds.
Total weight of bomb	220 pounds	554 pounds	1, 123 pounds.
Charge weight ratio		38 percent	47.7 percent.

Construction of body: The nose and barrel of the 100-kg. and 250-kg. are constructed of 1 piece machined tubular steel. On the 500-kg. a steel nosepiece is welded to a tubular-steel barrel. The after end of the barrel is threaded internally to receive the tail assembly. A row of 12 hexagonal bolts around the circumference of the bomb just forward of the after end of the barrel hold a steel reinforcing plate in place. This cylindrical section closed at one end by a perforated plate is strengthened by 3 strips of metal bent at a 60° angle, which divide it into 6 equal compartments. Twelve holes are drilled in the outer circumference of the section to accommodate the bolts. TNT is cast in the section to a point flush with its after edges. The tail cone is welded to a collar which screws into the after end of the barrel. Welded to the apex of the tail cone is a burster tube. This tube contains picric acid and is fitted with a fuze adapter at its after end.

Construction of tail: The tail fins are made from sheet steel. There are two layers of steel in each fin, a single piece having been bent double and the two inner edges welded to the tail cone and burster tube by a continuous weld. The forward and after ends of the fins are closed by welding. The tail fins are not supported by tail struts.

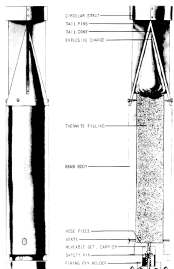


Figure 11—1-kg. Thermite Incendiary Bomb.

1-kg. Thermite Incendiary Bomb

Fuzes: Inertia impact fuze.
Overall length: 13½ inches
Length of body: $8\frac{5}{16}$ inches
Diameter of body: 2⅛ inches
Thickness of wall: ⅜ inch.
Material of wall: Magnesium.
Type of suspension: Cluster container.
Suspension lug: None.
Color and markings: Black over-all (prime coat of gold paint on the body only).
Length of tail: 5⅛ inches
Width of tail: 2⅛ inches
Width of tail fins: $1\frac{1}{16}$ inches
Dimensions of tail trusts: $\frac{13}{16}$ inch wide.
Material of tail: Light sheet metal.
Type of filling: Thermite.
Total weight of bomb: 2 pounds 12 ounces.

Construction of body: The bomb consists of a nosepiece, incendiary filled body and explosive filled tail. The nosepiece is made of magnesium and screws into the bomb body. At the flat forward end it is threaded centrally to receive the brass firing pin holder which contains a fixed steel firing pin. At the after end it is pierced by a flash hole. The recess within the nosepiece houses a movable detonator carrier and a creep spring. An off-center transverse safety pin prevents the detonator carrier from hitting the firing pin. The body is a thermite-filled cylindrical magnesium tube. The forward end is threaded internally to receive the nosepiece. The after end is boat-tailed to accommodate the conical tail cone. Three-fourths inch aft of the forward end are four vent holes, 90° apart. The conical tail cone, made of light sheet metal, slips over the boat-tailed after body of the bomb, and is secured to it by four screws. Each of the three fins, which are made of the same material as the cone, has its inner edge turned and held to the cone by four rivets. Where the three fins meet aft of the apex of the tail cone, they are braced and held together by angular metal strips, which are riveted onto both sides of each fin by two rivets. The outer edge of each fin is turned for a distance of ¾ inch from the after end. Six rivets hold these turned edges to a circular strut. Filling the inside of the tail cone is a conical cloth bag containing a pyrotechnic mixture which may have explosive properties.

Operation: The fuze is armed when the safety pin is removed. On impact the detonator carrier moves down against the creep spring and hits the firing pin. The resultant flash ignites the thermite filling of the bomb.

5-kg. Thermite Incendiary Bomb

Fuzes: Mechanical impact tail fuze.
Over-all length: 15¾ inches.
Length of body: 6¼ inches.
Diameter of body: $3\frac{11}{16}$ inches.
Thickness of wall: ⅛ inch.
Material of wall: Welded steel tube.
Type of suspension: Horizontal.
Suspension lug: ¾ inch steel band secured around the body by a nut and bolt, $\frac{5}{16}$ inch hole drilled in the extension of the band to accept metal hook.
Color and marking: Bomb body: Black or olive drab. Tail: Unpainted tin color.
Length of tail: 9 inches.
Width of tail: $3\frac{11}{16}$ inches.
Width of tail fins: None.
Dimensions of tail struts: None.
Material of tail: Tin-plated sheet steel.
Type of filling: Incendiary, consisting of a first fire charge and a main charge.
Total weight of bomb: 11 pounds.

Construction of body: The bomb body consists of a ⅛ inch thick steel tube welded longitudinally and closed at the forward end by a ¾ inch thick nose plug which is welded in place. A cylindrical wooden block is fitted part way into the aft end of the body and secured by six countersunk wood screws. The block contains the simple impact fuze and spring-loaded safety pin and also acts as the connecting element between the body and the tail. Two ⅜ inch vent holes are drilled longitudinally through the block 180° apart. The fuze is 2⅝ inches long and has a $1\frac{3}{16}$ inch diameter. The tubular aluminum body contains a striker and a creep spring. A solid threaded plug closes the aft end and a plug containing the primer screws into the forward end. A spring-loaded safety pin holds the striker in position. The incendiary filling in the bomb body consists of a first fire charge which is adjacent to the primer and a main charge below it. The first fire charge is a compressed black powder composed of magnesium, barium peroxide and potassium nitrate. The main charge is thermite.

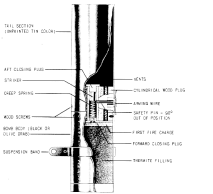


Figure 12—5-kg. Thermite Incendiary Bomb.

Construction of tail: The tail, consisting of a tinned sheet steel tube closed at the after end, is secured to the wooden block by five wood screws. The tail and body sections rest flush against one another, completely concealing the wooden block to which they are attached. A slot in the tail receives the brass safety pin housing which is contained in the wooden block.

Operation: When the bomb is released the arming wire is withdrawn, allowing the spring-loaded safety pin to fly out, arming the fuze. On impact, the striker compresses the creep spring and hits the primer. The explosion of the primer ignites the first fire charge and the thermite.

Type 97 12-kg. Thermite Incendiary Bomb

Fuzes: A–2 (a) (fitted with a magazine).
Over-all length: 25½ inches.
Length of body: 14½ inches.
Diameter of body: 4 inches.
Thickness of wall: 3/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.

Suspension lug: Normal Army suspension lug on barrel, plus an improvised suspension device described below.

Color and markings: Black over-all with a 5/16 inch white stripe just forward of the suspension lug.

Length of tail: 11 inches.

Width of tail: 5 7/16 inches.

Width of tail fins: 2 5/16 inches.

Dimensions of tail struts: Length, 3⅛ inches; width, ⅜ inch; thickness, 1/16 inch.

Material of tail: 1/16 inch rolled steel.

Type of filling: Three thermite-filled magnesium fire pots. Two black powder charges.

Weight of filling: Fire pots, 10 pounds; black powder charges, 11 ounces.

Total weight of bomb: 26 pounds.

Charge/Weight ratio: 38 percent.

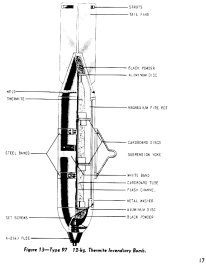


Figure 13—Type 97 12-kg. Thermite Incendiary Bomb.

Construction of body: A cast-steel nosepiece is screwed into a tubular-steel body. A normal hinged Army suspension lug and an additional suspension device are fitted to the body. The suspension device consists of two steel bands 11/16 inch wide, each secured around the body by a bolt and nut. The bands are joined by a steel strip ½ inch wide which is welded to them. A ¼ inch steel rod formed into a suspension yoke is welded to the steel strip. A tail cone is welded to a collar which fits into the after end of the body and is held in place by four rivets.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single row of box-type struts.

Operation: The fuze is armed in flight and on impact the magazine is fired which in turn ignites the black powder charge. The flash from this charge travels down a central flash channel igniting the incendiary composition in the fire pots and firing the black powder charge in the tail. The explosive force of the two black powder charges is sufficient to shear the four rivets at the after end of the bomb body and thus expel the fire pots.

Remarks: The suspension yoke will be found on this bomb only when it is suspended from a balloon.

Type 97 50-kg. Incendiary Bomb

Fuzes: Nose: A–2 (a) or A–2 (b); Tail: None.
Over-all length: 45 inches.
Length of body: ½ inch.
Diameter of body: 7½ inches.
Thickness of wall: 3/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army suspension lug.
Color and markings: Gray over all. A yellow and a white band are stenciled just forward of the suspension lug. There is a red band around the nose.
Length of tail: 18½ inches.
Width of tail: 9 3/16 inches.
Material of tail: Sheet steel.
Dimensions of tail struts: Length, 6¾ inches; diameter, 5/16 inch.
Type of filling: 400–450 rubber bungs (1 inch long by 1 inch diameter) impregnated with phosphorus dissolved in carbon disulphide. The high-explosive charge in the nose and central burster tube is picric acid.
Weight of filling: Incendiary filling, 37 pounds; picric acid, 5.5 pounds.
Total weight of bomb: 110 pounds.
Charge/weight ratio: 39 percent.

Construction of body: A steel nosepiece is held by three grub screws to a steel sealing plate. The plate is welded to a tubular-steel body by a continuous circumferential weld. A burster tube threads into the sealing plate and the joint is made airtight by a lead washer. A tail cone is welded to the after end of the body.

Construction of tail: Four steel fins are welded to the tail cone and are braced by two sets of tubular struts.

Remarks: This bomb case was originally designed to contain gas.

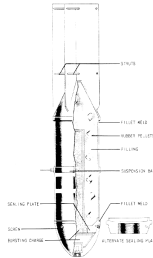


Figure 14—Type 97 50-kg. Incendiary Bomb.

Figure 15—Type 100 50-kg. Incendiary Bomb.

Type 100 50-kg. Incendiary Bomb

Fuzes: A–2 (a), A–2 (b), A–2 (c).
Over-all length: 40½ inches.
Length of body: 23¾ inches.
Diameter of body: 7 inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type.
Color and markings: Gray over-all with a white band forward of the suspension lug and a red band around the nose.
Length of tail: 16¾ inches.
Width of tail: 9¾ inches.
Width of tail fins: 4½ inches.
Dimensions of tail struts: Length, 5 5/16 inches; width, 1½ inches; thickness 1/16 inch.
Material of tail: Steel.
Type of filling: 400–450 rubber bungs (1 inch long by 1 inch diameter) impregnated with phosphorus dissolved in carbon disulphide. The high-explosive charge in the nose and central burster tube is picric acid.
Weight of filling: Incendiary filling, 35 pounds; picric acid, 5 pounds.
Total weight of bomb: 97 pounds.
Charge/weight ratio: 44 percent.

Construction of body: A steel nosepiece is held by three grub screws to a steel sealing plate. The plate is welded to a tubular steel body by a continuous circumferential weld. A burster tube threads into the sealing plate and the joint is made airtight by a lead washer. A tail cone is welded to the after end of the body.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single set of box-type struts.

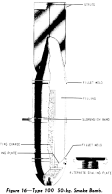


Figure 16—Type 100 50-kg. Smoke Bomb.

Type 100 50-kg. Smoke Bomb

Fuzes: A–2 (a), A–2 (b), A–2 (c).
Over-all length: 40½ inches.
Length of body: 23¾ inches.
Diameter of body: 7 inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel.
Type of supension: Horizontal.
Suspension lug: A normal Army suspension lug attached to a carrying band.
Color and markings: Grey over-all with a red band around nose. "50K" and the smoke symbol "T" are stenciled in white on the body.
Length of tail: 16¾ inches.
Width of tail: 9¾ inches.
Width of tail fins: 4½ inches.
Dimensions of tail struts: Length, 5⁵⁄₁₆ inches; width, 1½ inches; thickness, ¹⁄₁₆ inch.
Material of tail: Sheet steel.
Type of filling: FS Smoke analyzed to be chlorosulfonic acid, 41 percent, and sulphur trioxide, 54 percent, sulphuric acid, 5 percent.
Weight of filling: Chemical filling, 51 pounds. High-explosive filling, 6 pounds.
Total weight of bomb: 117 pounds.
Charge/weight ratio: 48 percent.

Construction of body: A steel nosepiece is held by three screws to be a steel sealing plate. The nosepiece houses a charge of picric acid. The sealing plate is welded to a tubular-steel body by a continuous circumferential weld. A burster tube containing picric acid threads into the sealing plate. A tail cone is welded to the after end of the body.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single row of box-type struts.

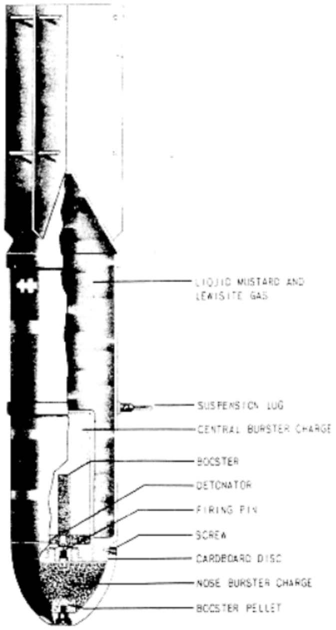


Figure 17—Type 92 50-kg. Gas Bomb.

Type 92 50-kg. Gas Bomb

Fuzes: A–2 (a), A–2 (b), A–2 (c).
Over-all length: 45 inches.
Length of body: 26½ inches.
Diameter of body: 7½ inches.
Thickness of wall: 3/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: A normal Army suspension lug attached to a carrying band.
Color and markings: Bomb is grey over all with a red-tipped nose and a blue band aft of the red band. There is a yellow band and white band forward of the suspension lug and a yellow band aft of the suspension lug.
Length of tail: 18½ inches.
Width of tail: 9 3/16 inch.
Width of tail fins: 4¾ inches.
Dimensions of tail struts: Length, 6¾ inches; diameter, 5/16 inch.
Material of tail: Sheet steel.
Type of filling: 50/50 Lewisite—mustard gas mixture.
Weight of filling: 50 pounds.
Total weight of bomb: 110 pounds.
Charge/weight ratio: 46 percent.

Construction of body: A steel nosepiece is held by three screws to the bomb body. The nose contains a picric acid burster charge. A tail cone is welded to the after end of the body; the body and tail cavity is filled with liquid gas. A central burster charge container is threaded into the forward end of the body. It houses a firing pin, detonator, booster and a picric acid burster charge.

Construction of tail: Four steel fins are welded to the tail cone and are braced by two sets of tubular struts.

Type 90 Small Model Parachute Flare

Over-all length of container: 26¼ inches.
Diameter of container: 2⅞ inches.
Over-all length of flare body: 14 inches.
Diameter of flare body: 2 7/16 inches.
Material of wall: Sheet steel.
Type of suspension: Thrown by hand from plane.
Color of markings: Container is blue over all. Flare body is a natural steel color.
Type of filling: A black powder ignition charge and a main filling of an illuminating composition of barium chlorate 75.2 percent, gum 24.8 percent.
Weight of filling: Illuminant, 4 pounds.
Total weight of flare: 8 pounds (approximately).

Description: Each flare is packed in a blue-tinned steel container which is opened by a tear off strip. Housed within the container is a split cardboard cylinder closed at one end with a cap and hinged at the other end. The cylinder contains a parachute and flare unit. The flare unit consists of a pull igniter, delay train, ignition charge and illuminating composition in a sheet-steel tube. The pull igniter wire is attached to the parachute shrouds.

The flare proper houses a pull-type igniter which is activated by the initial jerk at the opening of the parachute. The striker is spring loaded. Two arms pivoted on the striker release grip the eye on the end of the striker. The flare body is

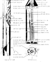


Figure 18—Type 90 Small Model Parachute Flare.

formed from varnished sheet steel rolled and soldered into the form of a cylinder. The case of the flare (furthest from the parachute) is serrated and the teeth crimped over the perforated disk. Two fiber washers and a steel cap held on by tape protect the network of powder strips. The end of the central tube passes through a hole in the center of the perforated disk and is crimped over it. An aluminum casting fits into the central tube and guides some of the powder strips in the disk through grooves in its face over the strips within the ignition tube. At the top of the flare is a wooden spacer drilled centrally to accommodate the central tube. A steel closing disk rests on the spacer and is soldered to the end of the central tube. The case is crimped over this disk. A conical cap with a hole in the apex to accommodate the pull wire is fastened to the case and spacer with three wood screws.

The main filling extends from the wooden spacer down to the ignition charge and is pressed into the flare case. Several coils of copper wire around the central tube prevent the filling from falling out of the base when the flare is burning in the air. The ignition charge is packed unevenly below the main filling.

Operation: The tear strip is removed and the cardboard cylinder slipped out. The cap is removed from the cylinder, binding tapes untied and the flare is dropped from the plane. The

resultant tug from the opening of the parachute pulls the igniter wire. The striker hits the cap which ignites the delay train which fires the ignition charge which in turn ignites the illuminating composition. Several coils of copper wire in the illuminant prevent the filling from falling out of the base while the flare is burning in the air.

The flare burns for 2 minutes and 40 seconds with an intense greenish-white flame.

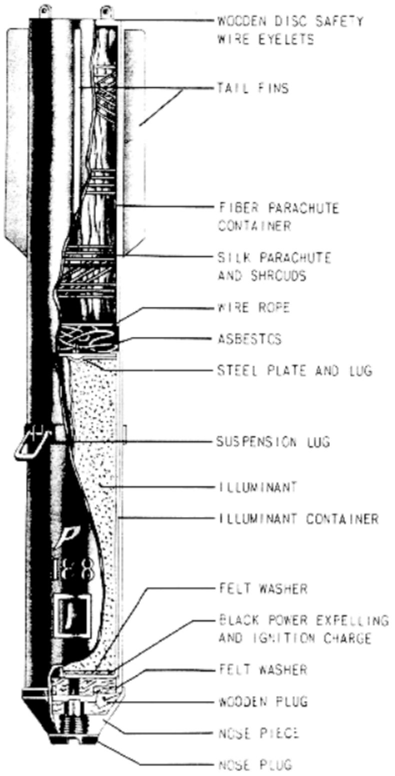


Figure 19—Type 1 12-kg. Parachute Flare.

Type 1 12-kg. Parachute Flare

Fuzes: D–5 (a).
Over-all length: 37 inches.
Length of body: 37 inches.
Diameter of body: 4 3/16 inches.
Thickness of wall: 1/16 inch.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type suspension lug.
Color and markings: Black over all.
Length of tail: 11¾ inches.
Width of tail: 6 1/16 inches.
Width of tail fins: 1 inch.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: Illuminant.
Weight of filling: Illuminant, 15 pounds.
Total weight of bomb: 27 pounds.
Charge/weight ratio: 57 percent.

Description: The cylindrical external case of sheet steel construction is closed at one end by a conical nose piece and at the after end by a wooden disk. The nose, threaded to receive a fuze, is filled by a wooden block. A black powder ignition charge is just aft of the block. The central body houses a parachute and a candle unit. The silk parachute is surrounded by a split cylindrical fiber housing. The shrouds are attached to a ⅜ inch wire rope 53 inches long which is attached to the candle unit. The illuminant is contained in a sheet-steel cylinder, open at the forward end and closed at the after end by a steel plate. The open forward end rests on the black powder charge in the nose. While carried in the plane a safety wire is passed through two eyelets at the tail end of the external case, preventing the parachute from coming out until the flare has been released from the plane.

Operation: When the fuze initiates explosion on the black powder charge, the resultant flash ignites the illuminant. The expanding gases cause both the parachute and the illuminant container to be expelled out the rear of the flare case. The parachute housing falls away allowing the parachute to be opened.

The illuminant burns for 1½ to 3 minutes with a greenish-white flame.

The main components of the illuminant are:

	Percent
Barium Nitrate	77
Aluminum	8. 8
Magnesium	4. 4
Sulphur	2. 2
Paraffin	4. 5

Type 3 Parachute Flare

Fuzes: D–5 (b).
Over-all length: 42½ inches.
Length of body: 39½ inches.
Diameter of body: 6¾ inches.
Thickness of wall: 3/64 inches.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type hinged suspension lug.
Color and markings: Dull red over all.
Length of tail fins: 11½ inches.
Width of tail fins: 1⅞ inches.
Dimensions of tail struts: 1 inch wide; 1/20 inch thick; 6¾ inches inside diameter.
Material of tail: Sheet steel.
Type of filling: Illuminant.
Weight of filling: 66 lb.
Total weight of bomb: 84 lb.

Construction of body: The flare consists of 3 main elements: (1) the flare case, (2) the illuminating candle unit, (3) the parachute.

1. The flare case consists of three sections: a nosepiece, body and end cap. The nosepiece is soldered securely to the body, and the hemispherical end cap is held in position by spot soldering in four places. Four tail fins are welded to the after two-fifths of the body. A steel ring 1 inch wide fits around the body at its junction with the tail cone. It is attached to the fins and serves to brace them as well as to retard the velocity of the flares free fall. The nose is threaded to receive the fuze.

2. The illuminant is contained in a cardboard canister which is covered by sheet brass 0.025 inch thick. The after end is closed by a steel plate held by screws to the cylinder. A ¼-inch wire rope 65 inches long from which the candle unit is suspended is attached to this steel plate by means of a shackle. The forward end of the container is open and fits against a wooden block in the nosepiece. The illuminant at the open end contains in its center an ignition charge 3 inches in diameter and ¼ inch thick.

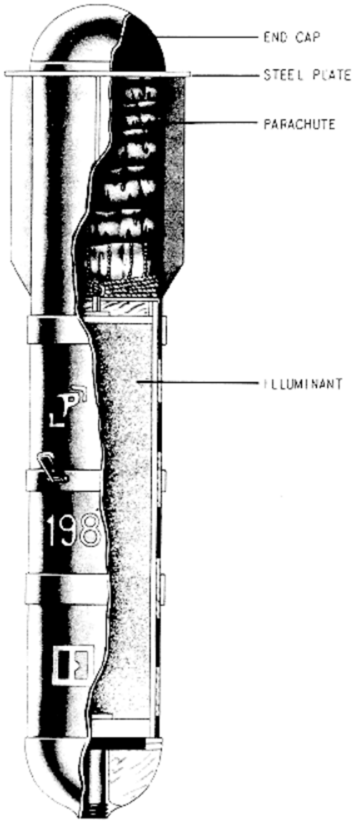


Figure 20—Type 3 Parachute Flare.

	Inches
Length of illuminant container	26
Length of illuminant	24½
Diameter of illuminant	5½

3. There is a single silk parachute housed in the after end of the body. It is surrounded by a layer of cardboard to insure smooth ejection.

Operation: Shortly after being released from the plane the aerial burst fuze operates. The resultant flash from the magazine ignites the ignition charge which in turn ignites the illuminant. The expanding gases force the end cap off and eject the parachute and illuminating candle unit. The flare sheds a bright white light and burns for 3 minutes and 40 seconds.

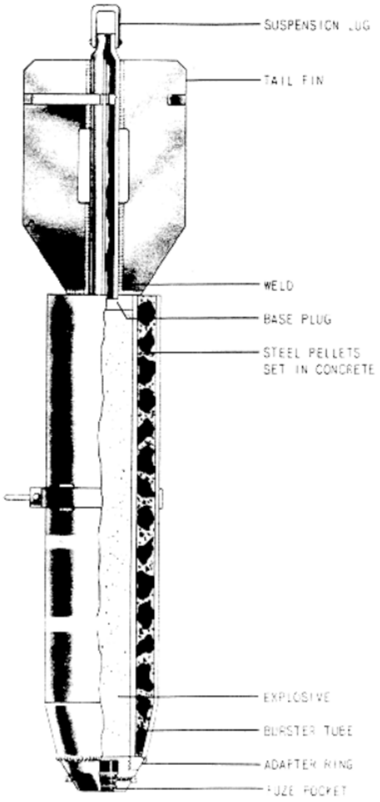


Figure 21—Type 97 15-kg. Concrete Bomb.

Type 97 15-kg. Concrete Bomb

Fuzes: A-2 (b), A-2 (d).
Over-all length: 26 inches.
Length of body: 17¾ inches.
Diameter of body: 4 inches.
Thickness of wall: 1/32 inch.
Material of wall: Sheet steel.
Type of suspension: Horizontal or vertical.

Suspension lug: A typical Army suspension lug attached to a steel band around the body. Another suspension lug is fastened to a pipe which is part of the tail assembly.
Color and markings: Black over all. Red stripe on nose. Yellow stripe and white stripe forward of suspension lug.
Length of tail: 8¼ inches.
Width of tail: 5½ inches.
Width of tail fins: 2¼ inches.
Dimensions of tail struts: Length, 3¾ inches; width, ½ inch; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: Cast picric in a central exploder tube surrounded by steel pellets set in concrete.
Weight of filling: Picric acid, 3 pounds.
Total weight of bomb: 32 pounds.

Construction of body: The body is constructed of a light sheet steel cylinder which surrounds a steel central burster tube. The space between the tube and the outercasing is filled with steel pellets set in concrete. The nose of the bomb is slightly tapered. A steel adapter ring is welded to the end of the nosepiece. It is threaded internally to receive another ring which contains the nose fuze pocket. The central burster tube is an explosive filled ⅛ inch steel cylinder, 2⅜ inches in diameter and 16½ inches long. A base plug is inserted into the after end of the central tube and held in place by a friction fit.

Construction of tail: A steel pipe ⅞ inch in diameter and 9 inches long is welded to the base plug. Four tail fins are welded to the pipe and to the base plug. The tail fins are braced by a single set of box-type struts. A hinged lug for vertical suspension is attached to the after part of the steel pipe.

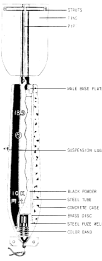


Figure 22—Type 94 10-kg. Substitute Bomb.

Type 94 10-kg. Substitute Bomb

Fuzes: A–2 (b).
Over-all length: 27½ inches.
Length of body: 18¾ inches.
Diameter of body: 4⅜ inches.
Thickness of wall: 1 inch (approximate).
Material of wall: Concrete.
Type of suspension: Horizontal.
Suspension lug: Normal Army hinged lug.
Color and markings: Black over-all with a red band on nose. Markings in white: weight, place, and date of manufacture.
Length of tail: 9¼ inches.
Width of tail: 5½ inches.
Width of tail fins: 2⅜ inches.
Dimensions of tail struts: Length, 3½ inches; width, ¼ inch; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: Central steel tube filled with black powder.
Weight of filling: 1.2 pound.
Total weight of bomb: 22 pounds.

Construction of body: The bomb consists of a thick concrete case surrounding a steel central tube. The tube is filled with loose black powder. It is threaded internally at both ends. A steel well containing a nose fuze pocket threads into the forward end of the tube. A brass disk is placed between the fuze and the black powder. The after end of the tube is closed by a male base plate. A length of pipe is attached to the base plate by four screws.

Construction of tail: Four tail fins are welded to the pipe extending from the base plate. Four single struts support the fins.

Type 1 30-kg. Substitute Bomb

Fuzes: A–2 (b), A2(d); B–1(a).
Over-all length: 32 inches.
Length of body: 20 inches.
Diameter of body: 5⅛ inches.
Thickness of wall: 1/8 inch.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: A typical hinged Army suspension lug is attached to a steel band which fits around the bomb.
Color of markings: Black over all with a red-tipped nose. Size and type of bomb are stenciled forward of the suspension lug. Place and date of manufacture are stenciled aft.
Length of tail: 11 13/16 inches.
Width of tail: 7 inches.
Width of tail fins: 2 inches.
Dimensions of tail struts: Length, 5 5/16 inches; width, 1 5/16 inch; thickness, 1/16 inch.
Material of tail: Sheet steel.

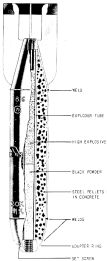


Figure 23—Type 1 30-kg. Substitute Bomb.

Type of filling: Main filling is steel pellets set in concrete. Central tube contains black powder and high explosive.

Weight of filling: Explosive filling, 2.8 lb.

Total weight of bomb: 63 lb.

Construction of body: The body is constructed of a light sheet steel cylinder which surrounds a steel central burster tube. The space between the tube and outer casing is filled with steel pellets set in concrete.

The nose section is welded to the barrel. A steel adapter ring is welded to the end of this section. The adapter ring is internally threaded to receive another ring which contains the nose fuze pocket.

The central exploder tube contains two tinned steel canisters. The forward container is filled with black powder. The larger after container is filled with a high explosive.

The tail cone is welded to the barrel and has a fuze pocket at its apex.

Construction of tail: Four tail fins are welded to the tail cone and braced by a single set of box-type struts.

Remarks: The bomb body and tail cone may be pierced by 4 rows of holes 90° apart. Each row contains 11 holes which are 1/64 inch in diameter. It is assumed that the purpose of the holes is to release the moisture and air in the newly cast concrete filling.

Type 95 4-kg. Practice Bomb

Fuzes: None.
Over-all length: 26 inches.
Length of body: 16½ inches.
Diameter of body: $4\frac{13}{16}$ inches.
Thickness of wall: Concrete nose, ⅝ inch. Steel body, $\frac{1}{32}$ inch.
Material of wall: Nose, concrete. Body, sheet steel.
Type of suspension: Horizontal.
Suspension lug: Rectangular suspension lug held to the bomb body by a steel eye.
Color and markings: Black over all, "4K" marked on the nose.
Length of tail: 9½ inches.
Width of tail: 4⅜ inches.
Width of tail fins: $1\frac{7}{16}$ inches.
Dimensions of tail struts: Length, 3½ inches; width, ¾ inch; thickness, $\frac{1}{32}$ inch.
Material of tail: Sheet steel.
Type of filling: Tannic chloride smoke compound.
Weight of filling: 6.4 ounces.
Total weight of bomb: 8.8 pounds.

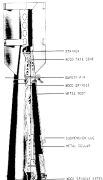


Figure 24—Type 95 4-kg. Practice Bomb.

Construction of body: The bomb is of three-piece construction consisting of a concrete nosepiece, sheet-steel body and wooden tail cone. The steel body fits over the after part of the nose and is held there by four screws. The nose houses a wooden spindle extension. A steel shear wire passes through the nose and spindle extension. A wooden spindle supported by a metal collar fits into the after end of the extension. The spindle extends the full length of the body and into the tail cone. The wooden tail cone is held to the after end of the body by four screws. It is drilled centrally to accommodate the spindle. A metal disk with a striker point is nailed to the after end of the spindle. A perforated steel cylinder is attached to the apex of the tail cone. This cylinder houses an ampoule containing the smoke compound. It is held in place by a base plate. A ⅜ inch steel safety pin fits through the tail cone and wooden spindle.

Construction of tail: Four steel fins are attached to the tail cone by screws and are soldered to the steel cylinder. The fins are braced by two sets of box-type struts.

Operation: The safetypin is removed and the bomb is dropped. On impact the nosepiece is crushed and the wooden spindle extension is pushed into the tail of the bomb shearing the shear wire. The striker point at the end of the spindle breaks the ampoule freeing the smoke compound.

Type 2 ⅓-kg. Cluster Bomb

Fuzes: B–5 (a).
Over-all length: 10¼ inches.
Length of body: 4¼ inches.
Diameter of body: 1⁵⁄₁₆ inches.
Thickness of wall: ¹⁄₃₂ inch.
Material of wall: Steel.
Type of suspension: Carried in clusters of 30 or 76 in a container.
Suspension lug: None.
Color and markings: Body is black with yellow band around center. The tail extension and tail are grey.
Length of tail: 6 inches.
Width of tail: 1¾ inches.
Width of tail fins: ⅞ inch.
Dimensions of tail struts: Diameter, 1¾ inches; width, 1½ inches; thickness, ¹⁄₁₆ inch.
Material of tail: Aluminum.
Type of filling: TNT, 60 percent; RDX, 40 percent.
Weight of filling: 4 ounces.
Total weight of bomb: 11 ounces.
Charge/weight ratio: 37 percent.

Construction of body: The cylindrical steel body is crimped around the nosepiece and screwed into the forward end of the tail extension. An inner cone is found at the forward end of the body which gives a "Monroe effect" on exploding. The tail cone which houses the fuze is screwed into the after end of the tail extension. The booster assembly is contained in the tail extension.

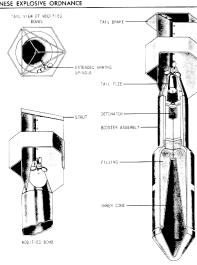


Figure 25—Type 2 1/3-kg. Cluster Bomb.

Construction of tail: Three aluminum tail fins are attached to the tail cone by screws. They are braced by a single hexagonal strut and by a hexagonal end plate. (See modified bomb.)

Remarks: Modified bomb: A container full of modified type 2 40-mm bombs has been recovered. These bombs are filled with Japanese Army Mark 2 explosive (TANOYAKU—50 percent TNT—50 percent RDX). A 3/16-inch layer of pure cyclonite poured in on top fills up the bomb body.

Evidently in an effort to reduce UXB's the arming spindle of recent bombs was lengthened

about ⅛ of an inch. This increase allows the cup-shaped vanes to protrude further into the wind stream.

The end plate on the modified bombs is omitted. A 3/16-inch strut at the extreme end of the fins is substituted. A golden lacquered, thin, tinned steel is substituted for the older type aluminum tail fins.

Captured documents describe the use of this bomb in air to air bombing.

Type 3 ½-kg. Cluster Bomb

Fuzes: A–6(a), A–6(b).
Over-all length: 4¾ inches.
Length of body: 2¾ inches.
Diameter of body: 2⅛ inches.
Thickness of wall: 3/64 inch.
Material of wall: Drawn steel.

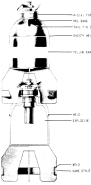


Figure 26—Type 3 ½-kg. Cluster Bomb.

Type of suspension: Carried in clusters of 63 in a container.
Suspension lug: None.
Color and markings: Black over all with 5/16 inch yellow stripe ½ inch forward of base and a red band around the nose.
Length of tail: 2 inches.
Width of tail: 3 inches.
Width of tail fins: 1⅛ inch.
Dimensions of tail struts: Length, 2 5/32 inches; width, ⅜ inch; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: TNT, 58 percent; RDX, 42 percent.
Weight of filling: 7 ounces.
Total weight of bomb: 14 ounces.
Charge/weight ratio: 50 percent.

Construction of body: The body consists of a drawn-steel cup to which is welded a cast-steel nose.

Construction of tail: Four tail fins are spot welded to the base of the body. They are supported by a single set of box-type struts.

Remarks: A distinguishing feature of these bombs is the construction which permits fitting the nose of one bomb into the tail of another. This union of the nose and tail serves two purposes: (1) It prevents the fuze vanes from rotating while in the cluster; (2) It decreases the length of the space needed to contain the fuzed bombs in cluster containers.

Type 2 ½-kg. Bomb

Fuzes: A–7 (a).
Over-all length: 4 13/32 inches.
Diameter of body: 2½ inches.
Thickness of wall: 3/32 inch.
Color and markings: Black over-all with red band around the nose.
Type of filling: TNT, 60 percent; RDX, 40 percent.
Weight of filling: 8 ounces.
Total weight of bomb: 14 ounces (without fuze).
Charge/weight ratio: 60.7 per cent.

Description: The bomb assembly consists of a small bomb and fuze, a reel of steel cable, and two parachutes packed in a split can with a hinged bottom and a screw top. The bomb proper is a steel cylinder closed at both ends. The walls and base are made in one piece with a smaller extension drawn out from the base to take the base

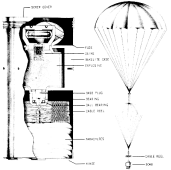


Figure 27—Type 2 ½-kg. Bomb.

plug. The nose end is closed by a disk welded onto the walls. A protruding threaded collar is welded onto the disk. The cable attachment is threaded to a base plug which screws into the base of the bomb and is held there by a locking nut.

A–7 (a) is an all-ways action fuze screwed into the nose collar of the bomb.

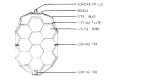
The parachute assembly consists of the main parachute, attached to the auxiliary parachute, which is attached to the reel containing 164 feet of 1/16 inch diameter steel wire, which is connected to the cable attachment on top of the bomb.

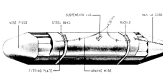
The small auxiliary parachute is 13⅜ inches in diameter unfilled, and is attached to the top of the reel by nine 15-inch silk shrouds. The main parachute is 36½ inches in diameter unfilled. Thirteen silk shrouds, 37⅜ inches long, are attached to a cord leading out of the top of the auxiliary parachute by 8⅜ inches of double bungee cord.

Operation: This bomb is designed for air to air bombing. Prior to release, the container lid is unscrewed and the safety pin removed from the arming vane. It is probable that the entire can without the lid is discharged from the airplane. Air resistance would quickly eject the contents from the container.

As soon as the bomb starts to fall through the air, the parachute opens, the cable partially unwinds, and the arming vane rotates. Ten revolutions suffice to unscrew the spindle from the fuze body; the vane and spindle then fall away. The striker and primer are now free in the fuze body, held apart only by a spring.

When the plane strikes the cable, the bomb is either drawn up against the plane or whipped up, eventually hitting the plane. On impact with the plane, inertia causing the fuze parts to move in any direction except toward the nose of the fuze, will cause the striker and primer carrier to be driven together, firing the fuze, and detonating the bomb.





Remarks: Since the fuze is designed not to fire when the bomb strikes on its nose, the bombs may not explode on impact with the ground (if it misses a plane). Since the spring is quite weak, a highly sensitive and dangerous UXB may be expected.

Container for 30 Type 2 ⅓-kg. Bombs

Fuzes: None.
Over-all length: 43 inches.
Length of body: 37 inches (including nose piece).
Diameter of body: Maximum, 7⅛ inches; Minimum, $4\frac{11}{16}$ inches.
Thickness of wall: $\frac{1}{16}$ inch.
Material of wall: Corrugated sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type suspension lug.
Color and markings: Black over all.
Length of tail: 6 inches.
Width of tail: 7⅛ inches.
Width of tail fins: None.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: 30 type 2 40-mm ⅓-kg. bombs.
Weight of filling: 22 pounds.
Total weight of bomb: 39 pounds.
Charge/weight ratio: 56 percent.

Figure 28—Container for 30 Type 2 ⅓-kg. Bombs.

Construction: The container is formed by three interlocking lengths of corrugated sheet steel. Each end is closed by a hollow cone made of sheet steel. The three interlocking lengths are held in position by two sheet steel bands and buckles. The buckles are prevented from opening by two arming wires.

Attached to the tail piece are three manila cords 13 inches long. To each of these is attached a steel hook which fits into a hole in each of the three body sections.

One of the three interlocking corrugated lengths serves as the top of the bomb. Spot welded to this is a smooth semicircular sheet steel piece 25½ inches long. The Army type suspension lug is attached to this piece. Eyebolts are welded on either side of the lug to serve as guides for the arming wires.

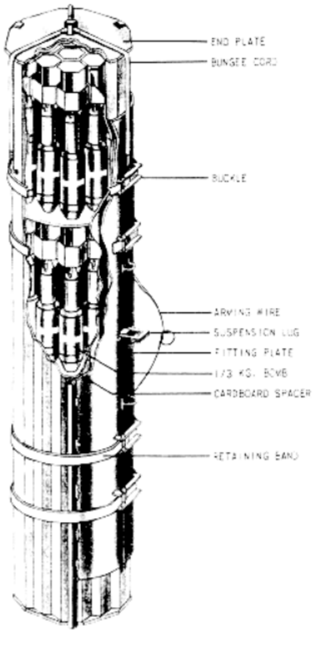


Figure 29—Container for 76 Type 2 ⅓-kg. Bombs.

Operation: When the container is released from the plane, the arming wire is withdrawn. The buckles open and the steel bands fall away. The three sections of the body separate allowing the bombs to fall free.

Remarks: Fitted around the container there may be a safety device consisting of a canvas strap, a black powder burster charge in a small container, and a friction igniter with a 2-second delay. The igniter cord is attached to the arming wire and as the container leaves the plane the delay train is ignited. After 2 seconds, the strap is blown apart and the sections of the container fall free.

Container for 76 Type 2 ⅓-kg. Bombs

Fuzes: None.
Over-all length: 41½ inches.
Length of body: 41½ inches.
Diameter of body: 8 inches.
Thickness of wall: 1/16 inch.
Material of wall: Corrugated sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army type suspension lug.
Color and markings: Black over-all.
Length of tail: None.
Width of tail: None.
Width of tail fins: None.
Dimensions of tail struts: None.
Material of tail: None.
Type of filling: 76 type 2 40-mm ⅓-kg. bombs.
Weight of filling: 56 pounds (approximate).
Total weight of bomb: 77 pounds.
Charge/weight ratio: 72 percent.

Construction of body: The container is formed by three interlocking lengths of corrugated sheet steel, closed at each end by hexagonal sheet steel plates. The three interlocking lengths are held in position by four encircling sheet steel bands and buckles. The buckles are prevented from opening by two arming wires. To a hub on the exterior of the after end plate are attached three bungee cords 7½ inches long, to each of which is attached a steel hook. Each hook fits into a hole in the side of each section of the container.

One of the three interlocking corrugated lengths serves as the upper portion of the horizontally

suspended container. To this upper portion is spot welded a smooth semicircular sheet steel piece 31½ inches long, in the center of which is located the suspension lug. On each side of the lug, between it and the inboard steel bands, there is welded an eyebolt to take the arming wires.

Operation: When the container is released from the plane, the arming wire is withdrawn. The buckles open and the steel bands fall away. The three sections of the body separate, allowing the bombs to fall free.

Remarks: Fitted around the container there may be a safety device consisting of a canvas strap, a black powder burster charge in a small container, and a friction igniter with a 2-second delay. The igniter cord is attached to the arming wire and as the container leaves the plane the delay train is ignited. After 2 seconds, the strap is blown apart and the sections of the container fall free.

Container for 63 Type 3 ½-kg. Bombs

Fuzes: None.
Over-all length: 42½ inches.
Length of body: 42½ inches.
Diameter of body: 8 inches.
Thickness of wall: 1/16 inch.
Material of wall: Corrugated sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Army suspension lug.
Color and markings: Black over-all.
Length of tail: None.
Width of tail: None.
Width of tail fins: None.
Dimensions of tail struts: None.
Material of tail: None.
Type of filling: 63 type 3 ½-kg. bombs.
Weight of filling: 69 pounds.
Total weight of bomb: 92 pounds.
Charge/weight ratio: 75 percent.

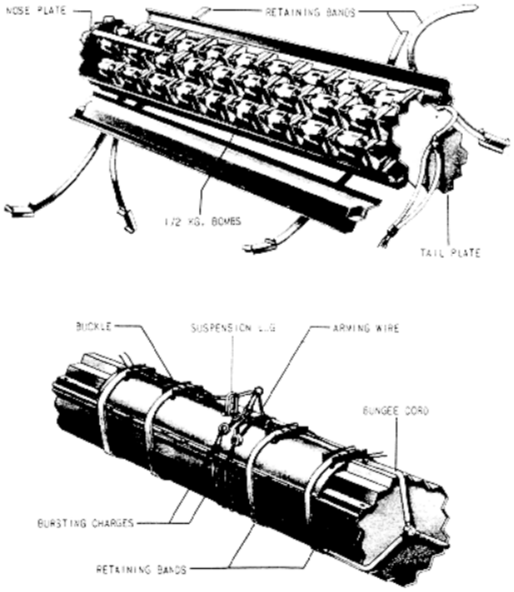


Figure 30—Container for 63 Type 3 ⅓-kg. Bombs.

Description: The container is formed by three interlocking sheets of corrugated steel closed at each end by hexagonal steel plates. The three side pieces are held in position by four encircling steel retaining bands and buckles. Two steel arming wires run longitudinally along the exterior of the container and pass through these buckles holding them closed. In addition two wires fit around the container. Where each of these wires is secured, there is a small black powder burster charge and a pull igniter. The pull cords of the igniters are attached to a ring on the arming wire.

The nose plate is held in position by metal tabs, bent 90° on the forward edges of the sidepieces. The nosepiece has fittings to hold the fuzes of the seven forward bombs and prevent the vanes from rotating. The other bombs are kept unarmed in the container by placing the nose of each in the tail of the one preceding.

One of the sidepieces serves as the upper portion of the horizontally suspended container. To this section is spot welded a smooth semicircular sheet steel plate 31 inches long in the center of which is located the typical Army suspension lug. On each

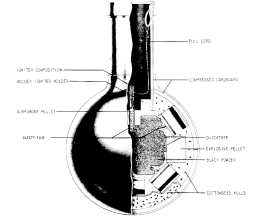


Figure 31—Type 1 1-kg. Aircraft Missile.

side of the lug between it and the inboard retaining bands, there is welded an eyebolt through which the arming wire passes.

The tail plate is held in position by three bungee cords which radiate from a central hub on the plate. Each cord terminates in a small hook which fits into a hole in each of the side pieces.

Operation: As the bomb container is released from the plane the arming wire is withdrawn. This releases the retaining band buckles and pulls the igniter cords. The retaining bands fall clear. After a 3-second delay the igniters fire the black powder charges, snapping the wires. The sidepieces of the container open at the forward end and allow the ½-kg. bombs to fall out nose first.

Type 1 1-kg. Aircraft Missile

Fuzes: Friction pull igniter.
Overall length: 8¾ inches.
Length of body: 5½ inches (spherical).
Diameter of body: 5½ inches (spherical).
Thickness of wall: ¼ inch.
Material of wall: Compressed paper.
Type of suspension: Thrown by hand.
Color and markings: Black over all (probably coated with a waterproofing liquid).
Type of filling: A central burster charge consists of granular black power in a silk bag. Surrounding the burster charge are 32 cylindrical sheet-metal pellets containing a low explosive charge. Each pellet has a ½ inch safety fuse which is in contact with the silk bag containing the central burster charge.
  Dimensions of pellets:
    Diameter: 1⅛ inches.
    Height: 13/16 inch.
  Composition of explosive contained in pellets:
    Potassium nitrate: 55.7 percent.
    Sulphur: 16.7 percent.
    Aluminum Powder: 14.6 percent.
    Antimony Sulphide: 13.0 percent.
  Cottonseed husks are used as packing to fill up the interior of the bomb.
Weight of filling: Burster charge: 4.50 ounces; Explosive pellets: 6.6 ounces.
Total weight of bomb: 36.5 ounces.

Construction of body: The missile consists of a spherical container of compressed paper from which a tubular neck of compressed cardboard projects approximately 3 inches. A wooden plug at the base of this tube houses the friction pull igniter.

Operation: The cord of the igniter is pulled and the missle is thrown from the plane. After a short delay the black powder burster charge explodes rupturing the paper body scattering the explosive pellets and simultaneously igniting the safety fuse of the pellets. After a short delay the pellets are detonated.

Remarks: This bomb has been reported to be used in air to air bombing. It has been recovered from crashed aircraft.

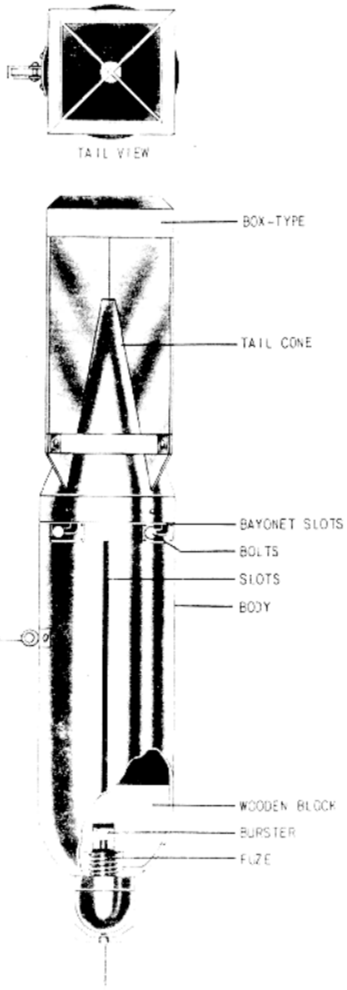


Figure 32—50-kg. and 100-kg. Pamphlet Container.

50-kg. and 100-kg. Pamphlet Container

Fuzes: D-1 (a), D-1 (b).

	50 kg.	100 kg.
Over-all length	37 inches	49 inches.
Length of body	19 inches	26 inches.
Diameter of body	7⅛ inches	9½ inches.

Thickness of wall: 3/16 inch.

Material of wall: Cardboard.

Type of suspension: Horizontal.

Suspension lug: Normal Army type suspension lug.

Color and markings: Brown over-all.

	50 kg.	100 kg.
Length of tail	18 inches	23 inches.
Width of tail	6¾ inches	13 inches.
Width of tail fins	3⅜ inches	7½ inches.
Dimensions of tail struts.	Forward: 6½ x 1½ x 3/16 inch. Aft: 6⅝ x 2⅜ x 3/16 inches.	Forward: 8⅝ x 1⅜ x 3/16 inch. Aft: 9¼ x 3¼ x 3/16 inches.

Material of tail: Cardboard.

Type of filling: Small bursting charge and paper pamphlets.

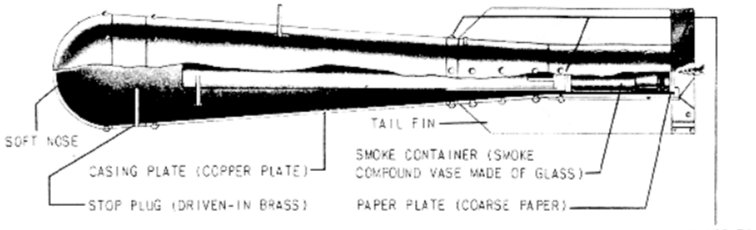
Construction of body: The cardboard body contains a hemispherical split wooden nose plug to which is nailed a nose fuze housing. A burster charge also fits into the cavity of the nose plug. There are two longitudinal slits in the body which terminate 2 inches from either end of the body. A cardboard tail cone is attached to the body by four bayonet joints which engage four bolts on the exterior of the bomb body.

Construction of tail: Four cardboard fins are taped to the tail cone and are braced by two sets of cardboard box type struts.

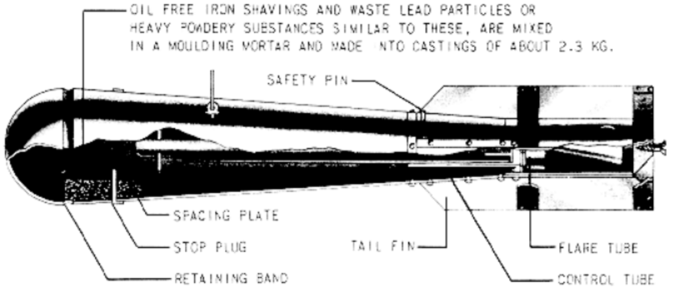
Remarks: The bursting charge splits the bomb longitudinally along the two slits into halves allowing the pamphlets to escape.

JAPANESE BOMBS REPORTED IN DOCUMENTS - NO SPECIMENS HAVE BEEN FOUND

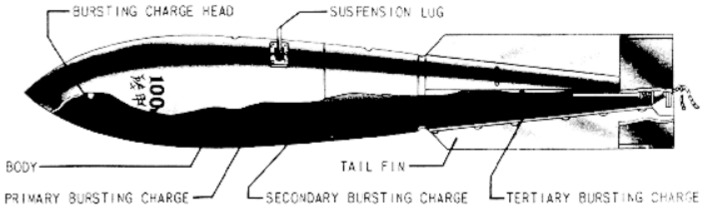
SMOKE COMPOUNDS (PURE SALT OXIDE NO. 2 TIN) TOTAL BOMB WEIGHT - 4.00 KG.
EMPTY BOMB WEIGHT - 3.775 (APPROX.)



TYPE 96 4KG. PRACTICE BOMB


OIL FREE IRON SHAVINGS AND WASTE LEAD PARTICLES OR HEAVY POWDERY SUBSTANCES SIMILAR TO THESE, ARE MIXED IN A MOULDING MORTAR AND MADE INTO CASTINGS OF ABOUT 2.3 KG.

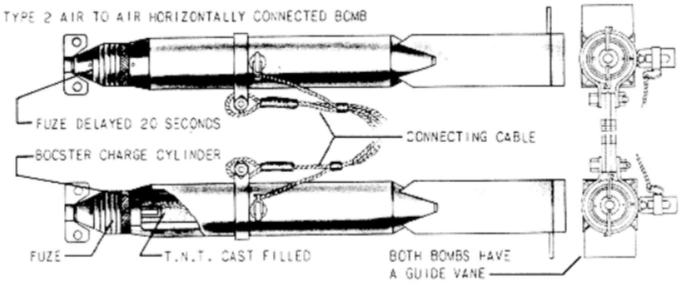
TYPE 96 4KG. NIGHT PRACTICE BOMB



12TH YEAR TYPE 100 KG. ARMOR PIERCING BOMB

Figure 33—Miscellaneous Army Bombs.

TYPE 2 AIR TO AIR HORIZONTALLY CONNECTED BOMB



TYPE 2 AIR TO AIR VERTICALLY CONNECTED BOMB

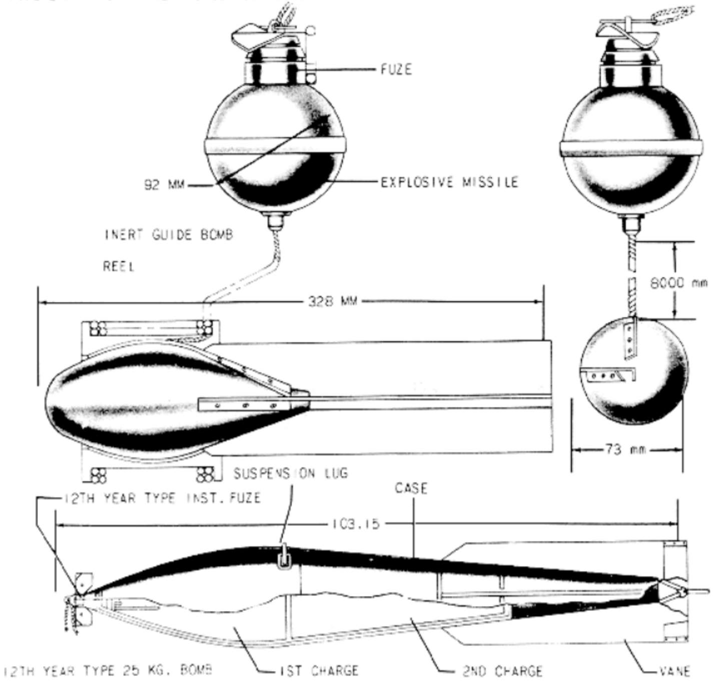


Figure 34—Miscellaneous Army Bombs.

Chapter 1—Section 2

JAPANESE NAVY BOMBS

Introduction

1. Designation

Japanese Navy bombs are divided into classes: land bombs, ordinary bombs, special bombs, smoke bombs, practice bombs, target-marker bombs, training bombs, and dummy bombs.

"Land" bombs are bombs specially designed for use against land targets. They are usually of rough construction

"Ordinary" bombs are designed for use against ships. They include both G. P. and S. A. P. types. They are of smoother construction than land bombs.

Special bombs are designed for various special purposes and each special class is indicated by a mark number. (See color chart.)

According to a captured document a new system of designating Navy bombs has been proposed. The existing bombs are not to be redesignated but new bombs will be assigned mark numbers as follows:

Marks 1 through 9, antishipping bombs.
Marks 10 through 19, chemically equipped bombs.
Marks 20 through 29, antiaircraft bombs.
Marks 30 through 39, antiland bombs.

As the name indicates practice bombs are used for practice bombing. Target-marker bombs are used as target marking beacons.

Dummy bombs are used for training and practice bombing. Training bombs are used for training in handling bombs.

Smoke bombs are used for concealment purposes.

Individual bombs in these main general classes are given further designations.

a. The type number discloses the year that the bomb was adopted for service use.

In the "land" and "ordinary" bomb classes, the first bomb of a given weight class is not assigned a type number but is merely indicated by the weight number. Subsequent designs of the same weight are assigned type numbers. Thus there is a No. 6 land use bomb and a type 97 No. 6 land use bomb.

b. The number indicates the weight of the bomb in units of tens of kilograms. Thus a No. 6 bomb weighs 60 kg., a No. 25 bomb weighs 250 kg, etc. This designation is as much an indication of size as it is of weight, No. 6 indicating a bomb of the 60 kg. size, and approximate weight.

c. A description of the bomb is indicated by the characters for land use, ordinary, etc. If it is a special bomb, the mark number is given.

d. Model: This term has several meanings but in this instance is used to distiguish different designs of bombs in the same general class.

e. Modification: This term represents a minor change in design or a change in filling.

2. Construction

There are two main patterns of construction of Navy bombs, typified by the "land" bombs and the "ordinary" bombs.

a. Land bombs: Land bombs are of three-piece construction. The nose is attached to the cylindrical body either by welding and riveting or by welding alone. The tail cone, which is filled with explosive is attached to the body by means of a collar or coupling ring. Either the body or tail cone is attached to the collar by welds and/or rivets and the final junction is made by attaching the other part to the collar by screws.

b. Ordinary bombs: Ordinary bombs are of two-piece construction. The nose and body are manufactured of one piece, and are machined both inside and out. If the tail cone is filed it is threaded into the body or in the case of larger bombs an interrupted screw arrangement is used to attach it to the body. If the tail cone is empty a male base plate closes the after end of the body and the cone is attached to the base plate by threads or screws.

The construction of special bombs and other general classes varies greatly and is covered in the description of each individual bomb.

3. Suspension

Bombs up to and including 250 kg. are suspended by a single U-shaped fixed lug. Two lugs 180° apart may be fitted to the bomb. Larger bombs may be suspended from a torpedo-

release gear by two flat guide studs located 180° apart or by a suspension band fitted with the standard lug.

4. Fillings

Navy bombs are generally filled by casting the explosive directly into the case. The cavity is protected by a thick coat of lacquer. In some instances the explosive may be preformed into paper-wrapped sections which are usually additionally protected by a wax or a flannel coating.

5. Color and markings

During the war the Japanese Navy has modified the color system used to differentiate its bombs. Under both the new and old systems, the basic body color is grey; this color varies from greenish-grey to bluish-grey depending on variations in the paint and weathering conditions. This grey paint is applied over a red anticorrosive paint.

The old color pattern consisted of painting key colors as a broad band on the nose and tail struts. Usually these colors were the same. A band slightly aft of the suspension lug was an additional key. Thin red stripes 180° apart running from nose to apex of tail cone appeared on all service bombs.

In the new scheme all bombs containing explosive have the nose tipped in green. Key color bands appear aft of the green tip and an additional key color band may appear on the tail strut. The red stripes have been dropped. Colored body bands are used in some instances to indicate different modifications. (See color chart.)

6. Size

The largest bombs recovered are 1,500 kg. bombs.

7. Fuzing

As a rule Navy bombs of 250 kg. and larger in weight are fitted with fuze pockets in both nose and tail. The No. 6 and No. 3 sizes of land use and ordinary bombs have nose pockets only.

COLOR MARKINGS OF JAPANESE NAVY BOMBS

The following information is compiled from documents and from inspection of captured ordnance. In the table the nose, the body, and the tail strut colors are listed. A combination like "Gr/Br" indicates a nose tipped in green with an adjacent brown identifying band. Body bands are noted where present.

Bomb	Color markings		Additional information
Land	Gr Gy Gr Blue Band	Gr/Br Gy Gy	Used against land targets.
Ordinary	Gr Gy Gr	Gr/Br Gy Gy	Used against ships.
Mark 1		Gr/Yel Gy Yel	Chemical bomb (gas).
Mark 2	Blue Gy Blue	Gr/Blue Gy Gy	Antisubmarine.
Mark 3	Silver Gy Silver	Gr/Silver Gy Red	Used in air to-air bombing.
Mark 4		Gr/Wh Gy Red	Rocket bomb. Dive bombing of capital ships.
Mark 5		Gr/wh Gy Gy	A. P. Bomb. Used against capital ships.
Mark 6		Gr/Red Gy Red	Incendiary.
Mark 7		Gr/Purple Gy Purple	Bacillus bomb.
Mark 8		Gr/Br Gy Gy	Antishipping "Skip" bomb.
Mark 19			Special bomb fired by fighters at bomber formations. Changed to Mk 28.
Mark 21		Gr/Br Gy Gy	Cluster of small bombs.
Mark 22			Cluster of "Spike" bombs. Obsolete.
Mark 23		Gr/Br Gy Gy	Time bomb.
Mark 24			Cluster of parchute bombs.
Mark 25			Cluster of "Wedge" Bombs.
Mark 26			Time bomb. Nose charge prevents penetration of remainder of bomb. Not produced.
Mark 27		Gr/Sil Gy/Red	Phosphorus filled bomb. Rocket for use against bomber formations.
Mark 28		Gr/Br Silver Red	Rocket type bomb. 10 kg. high explosive.
Mark 31		Gy Gy Gy	Land targets. Uses an influence fuze.
Dummy		Gr/Black Wh Wh	Used for training and release tests.
Practice	Gr Black Wh	Gr/Black Wh Wh	Used for training and practice.
Training		Black overall	Used for training in installing, loading, etc.
Smoke		Gr/Black, Gy Gy	Used for concealing ships.

NAVY EXPLOSIVES

Explosive	Use	Japanese Designation	Remarks
Primers (cap composition):			
1. Potassium chlorate Antimony Sulfide.	Primer cap composition.		
Initiators (detonators):			
2. Mercury fulminate	Initiator for fuzes		In some instantaneous gaines the striker may fire the initiator directly.
3. Lead azide	Initiator for fuzes	Chikkaen	
Boosters:			
4. Tetryl	Subbooster in gaines; occasionally sole booster.		Pressed. Toxic.
5. Picric acid	Main booster in many gaines.	Shimose bakuyaku=shimose explosive.	Pressed. Toxic.
6. Trinitroanisol, 70 percent; H. N. D., 30 percent.	Auxiliary booster in bombs.	H_2 kongo—H_2 mixture (abbr. for Type 98).	Pressed. Toxic.
Main charges:			
7. Picric acid	Bombs, projectiles, sea mines, land mines.	Shimose Explosive	Cast either into case or into preformed paper-wrapped blocks. Toxic.
8. Ammonium perchlorate, 66 percent; silicon carbide, 16 percent; wood pulp, 12 percent; oil, 6 percent.	Mines and depth charges.	Type 88	Loose grey powder. Dangerous to burn, very sensitive to friction. Documents give ferro-silicon in place of silicon carbide.
9. Trinitroanisol	Bombs	Type 91	Cast. Toxic.
10. Trinitroanisol, 60 percent; R. D. X., 40 percent.	Torpedo warheads	Type 94	Known from documents only. Toxic.
11. TNT, 60 percent; H. N. D., 40 percent.	Torpedo warheads depth charges (documents only).	(Seigate) = Type 97 block-fitted.	Cast into blocks which are packed into warhead. Yellow (darker than picric). Toxic.
12. Trinitroanisol, 70 percent; H. N. D., 30 percent.	Bombs, sea mines, depth charges.	Type 98	Cast into case. Greenish-yellow. Stains brown. Toxic.
13. Ammonium picrate, 81 percent; aluminum powder, 16 percent; wood pulp, 2 percent; oil, 1 percent.	Depth charges	Type 1	Loose greenish-yellow powder.
14. TNT, 60 percent; H. N. D., 24 percent; aluminum powder 16 percent.	Torpedo warheads	Otsu—B	Known from documents only. Approximates German hexanite. Toxic.

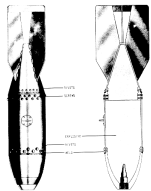


Figure 35—Type 97 No. 6 Land Bomb.

Type 97 No. 6 Land Bomb

Fuzes: A–3(a).
Over-all length: 40 inches.
Length of body: 21¾ inches.
Diameter of body: 7⅝ inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy type.
Color and markings: Gray over all with a green band on the nose, green tail struts, and a blue band around the body. Two thin red lines 180° apart run longitudinally along the bomb. New type markings will be found.
Length of tail: 18 3/16 inches.
Width of tail: 10⅝ inches.
Width of tail fins: 4¾ inches.
Dimensions of tail struts: Length, 7⅛ inches; width, 1⅜ inches; thickness, 3/32 inch.
Material of tail: Sheet steel.
Type of filling: Picric acid or type 98 explosive.
Weight of filling: 50 pounds.
Total weight of bomb: 124 pounds.
Charge/weight ratio: 40 percent.

Construction of body: A cast-steel nose is attached by a continuous weld and 2 rows of 10 rivets each to a tubular-steel body. A circumferential weld to a collar which fits into the after end of the body is held there by 2 rows of screws (14 per row).

Construction of tail: Four fins are spot welded to the tail cone and braced by a single set of box-type struts.

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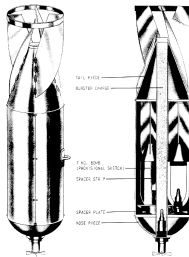


Figure 36—Type 2 No. 6 Land Bomb Model 5.

Type 2 No. 6 Land Bomb Model 5

Fuzes: A-3 (a), A-3 (b).
Over-all length: 42 inches.
Length of body: 25¾ inches.
Diameter of body: 10 inches.

Thickness of wall: 1/16 inch.
Material wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Standard Navy type suspension lug.
Color and markings: Gray over-all with a brown nose section. New type color markings will be found.
Length of tail: 16¼ inches.
Width of tail: 10 inches.
Width of tail fins: 4¼ inches.
Dimensions of tail struts: Diameter, 10 inches; width, 1 inch; thickness, 1/8 inch.
Material of tail: Sheet steel.
Type of filling: Five 7-kg. high-explosive bombs and a high-explosive central burster charge.
Total weight of bomb: 132 pounds (approximate).

Construction of body: A hollow-steel nosepiece and a hollow tail cone are connected by an explosive-filled central tube on the inside and two half cylinders of sheet steel on the outside. The two half cylinders are connected by four metal tabs riveted to each half of the cylinder on the inside. There are four notches 1/8 inch square and 90° apart in each end of the assembled cylinder. The notches fit around the four pins which are on the nosepiece and tailpiece. There is a spacer plate and five spacer strips attached to the central tube.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single circular strut at the after end. The fins are set at an angle to the tail cone in such a manner that they will impart a rotary motion to the container when it is dropped. Description of 7-kg. high-explosive bomb.—No fuze or complete bomb has been found. The only information available on the bomb and fuze comes from a captured Japanese bomb chart. The bombs are alleged to be nose fuzed, 20¼ inches long and 3½ inches in diameter.

The tail fins from several of the bombs have been found. The tail fins are painted gray. They are made up of two metal strips, the widest one has a 4¼-inch slot which allows the narrower one to fit into it. The fins are spot-welded at the extreme ends of the slot. The tail fins are braced by box-type struts welded to the after-most end.

Dimensions:

	Width (inches)	Length (inches) (approx.)	Thickness (inches)
Wide fin	4¼	10⅝	1/16
Narrow fin	3½	10⅜	1/16
Tail struts	13/32	2¾	1/16

Remarks: Production of this bomb ceased before the end of the war.

No. 25 Land Bomb and Type 98 No. 25 Land Bomb

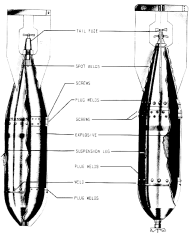
Fuzes: A–3 (a), A–3 (b), C–2 (a), B–3 (a), C–1 (a).

	No. 25	Type 98 No. 25
Over-all length	72 inches	72 inches.
Length of body	35½ inches	39½ inches.
Diameter of body	13¾ inches	12 inches.
Thickness of wall	¼ inch	½ inch.

Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with a green nose band and green tail struts. There are two thin, red lines 180° apart along the length of the bomb. New type color markings will be found.

	No. 25	Type 98 No. 25
Length of tail	36½ inches	32½ inches.
Width of tail	19 5/16 inches	16⅝ inches.
Width of tail fins	7⅝ inches	7 5/16 inches.

Dimensions of tail struts: Length, 13⅛ inches; width 2¼ inches; thickness, 5/32 inch.
Material of tail: Sheet steel.



NO. 25 LAND

TYPE 98, NO. 25 LAND

Figure 37—No. 25 Land Bomb and Type 98 No. 25 Land Bomb

	No. 25	Type 98 No. 25
Type of filling	Type 98 explosive.	Picric acid or type 98 explosive.
Weight of filling	330 pound.	211 pound.
Total weight of bomb	550 pound	532 pound.
Charge/weight ratio	60 percent	40 percent.

Construction of body: No. 25 Land: A cast-steel nose is welded to a tubular-steel body by a continuous weld and a row of 16 plug welds. The tail cone is held by 1 row of 32 screws to a collar which is held in the base of the bomb by a row of 16 plug welds. There is a threaded fuze pocket in both the nose and tail.

Type 98 No. 25 Land: A cast-steel nose is welded to a tubular-steel body by a continuous weld and 1 row of 12 large plug welds. The tail cone is held by 1 row of 18 plug welds and a continuous weld to a collar which is held in the base

of the bomb by 40 screws in 2 rows of 20 each. There is a threaded fuze pocket in both the nose and tail.

Construction of tail: Four fins are spot-welded to the tail cone and braced by a single set of box-type struts.

Remarks: The type 98 bomb is reported in some instances to be turned down to appear smooth on the exterior surface.

No. 80 Land Bomb

Fuzes: A–1 (c), B–3 (b), A–3 (d).
Over-all length: 113 inches.
Length of body: 72 inches.
Diemeter of body: 18 inches.
Thickness of wall: ½ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Two guide studs on the bomb body position a carrying band to which a suspension lug is attached.
Color and markings: Grey over-all. Green nose and tail struts. Two red lines 180° apart along the longitudinal axis of the bomb. Blue band around the body. New type markings will be found.
Length of tail: 41 inches.
Width of tail: 25 inches.
Width of tail fins: 10½ inches.
Dimensions of tail struts: Length, 17¼ inches; width, 3⅝ inches; thickness, ⅜ inch.
Material of tail: Steel.
Type of filling: Picric acid (tail cone is filled), or type 98 explosive.
Weight of filling: 842 pounds.
Total weight of bomb: 1,760 pounds.
Charge weight ratio: 48 percent.

Construction of body: A cast-steel nose is attached to a tubular body by a continuous circumferential weld and 3 rows of 14 rivets each. The tail cone is held by a continuous circumferential weld and 2 rows of 16 rivets each to a collar which is held in the base of the bomb by 2 rows of round-headed screws (32 screws in each row). This bomb has a threaded fuze pocket in both the nose and tail.

Construction of tail: Four ⅜ inch steel fins are spot welded to the tail cone and are braced by a single set of box-type struts.

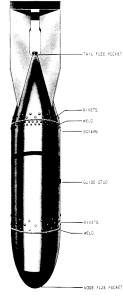


Figure 38—No. 80 Land Bomb.

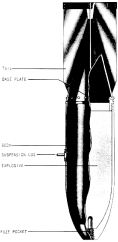


Figure 39—Type 99 No. 6 Ordinary Bomb.

Type 99 No. 6 Ordinary Bomb

Fuzes: A–3 (a), A–3 (b).
Overall length: 42¼ inches.
Length of body: 25½ inches.
Diameter of body: 8⅞ inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with a green nose band and green tail struts. There are two thin red lines 180° apart along the length of the bomb. New type color markings will be found.
Length of tail: 16⅞ inches.
Width of tail: 12¼ inches.
Width of tail fins: 5⅝ inches.
Dimensions of tail struts: Length, 9 inches; width, 1 inch; thickness, $\frac{1}{16}$ inch.
Material of tail: Steel.
Type of filling: Picric acid or type 98 explosive.
Weight of filling: 70 pounds.
Total weight of bomb: 138 pounds.
Charge/weight ratio: 50 percent.

Construction of body: The body is constructed of 1 piece of machined forged steel. It is threaded in the nose to receive a fuze. The after end of the body is threaded internally to accommodate a male base plate. A tail cone is secured to the base plate by a single row of 20 screws. There is no explosive in the tail cone.

Construction of tail: Four fins are welded to the tail cone and braced by a single set of box-type struts.

Type 99 No. 25 Ordinary Bomb Model 1

Fuzes: A–3 (a), A–3 (b), B–2 (a).
Over-all length: 68 inches.
Length of body: 39¾ inches.
Diameter of body: 11½ inches.
Thickness of wall: ¾ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with a green nose band and green tail struts. There are two thin red lines 180° apart along the length of the bomb. New type color markings will be found.
Length of tail: 28 inches.
Width of tail: 16¾ inches.
Width of tail fins: 6$\frac{15}{16}$ inches.
Dimensions of tail struts: Length, 12 inches; width 1⅝ inches; thickness $\frac{1}{16}$ inch.
Material of tail: Steel.
Type of filling: Type 91 (trinitroanisol).
Weight of filling: 132 pounds.
Total weight of bomb: 550 pounds.
Charge/weight ratio: 24 percent.

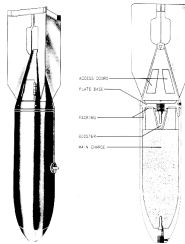


Figure 40—Type 99 No. 25 Ordinary Bomb Model 1.

Construction of body: The body is constructed of one piece of machined forged steel. It is threaded in the nose to receive a fuze. The after end of the body is threaded internally to accommodate a male base plate. The base plate is drilled centrally to receive the tail fuze. A tail cone is secured to the base plate by six screws. The cone is empty and has three hinged doors to permit access to the tail fuze pocket in the base plate.

Construction of tail: Four fins are welded to the tail cone and braced by a single set of box-type struts.

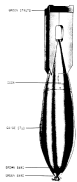


Figure 41—Type 2 No. 50 Ordinary Bomb Model 1.

Type 2 No. 50 Ordinary Bomb Model 1

Fuzes: A–3 (f), B–2 (a).
Over-all length: 78 inches.
Length of body: 38½ inches.
Diameter of body: 15½ inches.
Thickness of wall: 1 inch at base, 7½ inches at nose.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Two guide studs on the bomb body position the Navy type suspension band.
Color and markings: The bomb is gray overall with a green-tipped nose, brown nose band and green tail struts.
Length of tail: 39½ inches.
Width of tail: 15½ inches.
Width of tail fins: 7¾ inches.
Dimensions of tail struts: Length, 10¾ inches; width 3¼ inches; thickness, ⅛ inch.
Material of tail: Steel.
Type of filling: Cast blocks of Type 98 explosive.
Weight of filling: 148 pounds.
Total weight of bomb: 1,100 pounds.
Charge/weight ratio: 13 percent.

Construction of body: The bomb body is constructed of one piece of machined forged steel. A fuze pocket is drilled in the nose. The after end of the body is threaded internally to accommodate a male base plate. There is a fuze pocket drilled in the base plate. A sheet steel tail cone is attached to the base plate by eight bolts. Three trap doors in the tail cone give access to the fuze pocket.

Construction of tail: Four Navy type tail fins are spot-welded to the tail cone. They are braced by a single set of box-type struts.

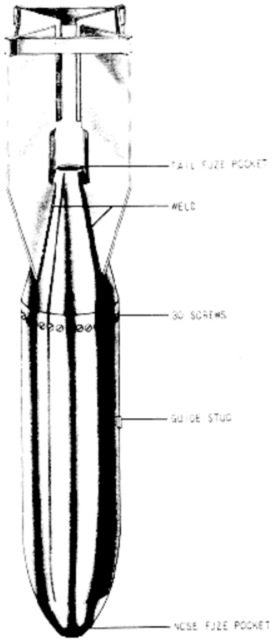


Figure 42—No. 80 Ordinary Bomb Model 1.

No. 80 Ordinary Bomb Model 1

Fuzes: Nose: A–1 (c), A–3 (d); tail: B–3 (b).
Over-all length: 111⅜ inches.
Length of body: 62 inches.
Diameter of body: 17½ inches.
Thickness of wall: ¾ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Two guide studs on the bomb body position a carrying band to which a suspension lug is attached.
Color and markings: Gray over all. Green nose and tail struts. Two red lines 180° removed along the longitudinal axis of the bomb. New type markings will be found.
Length of tail: 49 inches.
Width of tail: 24⅜ inches.
Width of tail fins: 10⅝ inches.
Dimensions of tail struts: Length, 3⁵⁄₁₆ inches; width, 17¾ inches; thickness, ⁵⁄₃₂ inch.
Material of tail: Steel.
Type of filling: Type 91 explosive (cone is filled).
Weight of filling: 770 pounds (approximate).
Total weight of bomb: 1,820 pounds.
Charge/weight ratio: 41.7 percent.

Construction of body: The bomb body is constructed of 1 piece of machined forged steel. A fuze pocket is drilled in the nose. A tail cone is screwed onto an adapter ring which fits into the after end of the body and is held there by 30 flat-headed screws.

Construction of tail: Four ⅛-inch steel fins are welded to the tail cone and are braced by a single set of box-type struts.

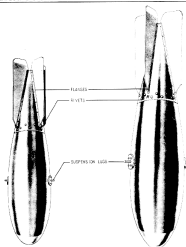


Figure 43—No. 3 Ordinary Bomb Model 2 and No. 6 Ordinary Bomb Model 2.

No. 3 Ordinary Bomb Model 2 and No. 6 Ordinary Bomb Model 2

Fuzes: A-1 (a), A-3 (a)	**No. 3**	**No. 6**
Over-all length	33 inches	42½ inches.
Length of body	19¾ inches	25½ inches.
Diameter of body	7½ inches	9 inches.
Thickness of wall	¼ inch	⅜ inch.

Material of wall.......... Steel.

Type of suspension...... Horizontal.

Suspension lug: Two typical Navy suspension lugs 180° removed on the circumference of the bomb body.

Color and markings: Gray over all with a green band on nose and on the ends of the tail fins. Two red lines diametrically opposed run the length of the bomb. New type markings may be found.

	No. 3	No. 6
Length of tail	13¼ inches	17 inches.
Width of tail	7½ inches	9½ inches.
Width of tail fins	3¼ inches	4¼ inches.
Dimensions of tail struts	None	None.
Material of tail	Sheet steel	Sheet steel.
Type of filling	Probably picric acid.	Picric acid.
Weight of filling		65 pounds, 12 ounces.
Total weight of bomb	70 pounds	139 pounds.
Charge/weight ratio		47 percent.

Construction of body: The body is constructed of one piece of machined steel turned down to a streamlined shape. The forward end is threaded to receive a nose fuze and the after end is threaded to receive a male base plate. The base plate is threaded externally at both ends. The tail cone screws onto the after end of the base plate. There is no explosive in the tail cone.

Construction of tail: The tail cone consists of four sheet metal sections riveted to an internally threaded ring. The edge of each section has a flange which turns up. The tail fins are secured between flanges of adjoining sections by spot welds. There are no struts to brace the fins.

No. 25 Ordinary Bomb Model 2

Fuzes: Nose: A–3 (a); tail: B–3 (a).
Over-all length: 71½ inches.
Length of body: 44½ inches.
Diameter of body: 14 inches.
Thickness of wall: ⅝ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with a green band on the nose and green tail struts. New type color markings will be found.
Length of tail: 27 inches.
Width of tail: 14 inches.
Width of tail fins: 4 3/32 inches.
Dimensions of tail struts: Length, 10 inches; width, 2⅛ inches; thickness, 1/16 inch.
Material of tail: Steel.
Type of filling: Picric acid, cast. Tail cone is filled.
Weight of filling: 228 pounds.
Total weight of bomb: 557 pounds.
Charge/weight ratio: 41 percent.

Construction of body: The body is constructed of one piece of machined forged steel. There is a threaded nose fuze pocket at the forward end. The after end of the body is threaded internally to receive a tail cone. The tail cone is explosive filled and has a fuze pocket at its apex.

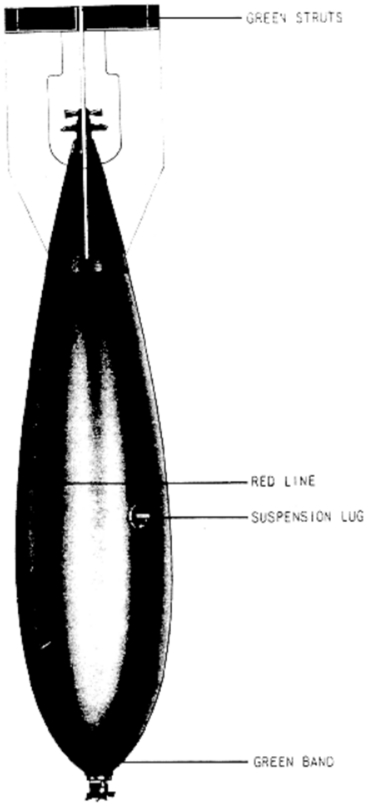


Figure 44—No. 25 Ordinary Bomb Model 2.

Construction of tail: Four fins are welded to the tail cone and braced by a single set of box-type struts.

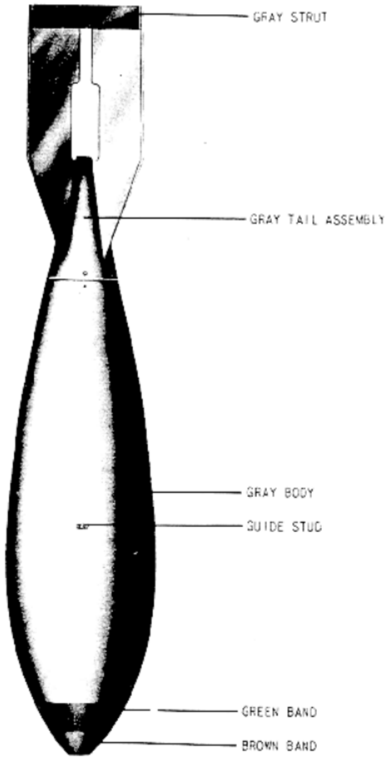


Figure 45—No. 50 Ordinary Bomb Model 2.

No. 50 Ordinary Bomb Model 2

Fuzes: A–3 (d), B–3 (b).
Over-all length: 90 inches.
Length of body: 57 inches.
Diameter of body: 17¾ inches.
Thickness of wall: Nose, 4 inches; base, ½ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: An eyebolt welded to a suspension band which fits around the bomb body. The band is positioned by two guide studs 180° apart on the bomb body.
Color and markings: Gray over all. Green band around the nose and a brown band aft of it.
Length of tail: 33 inches.
Width of tail: 17¾ inches.
Width of tail fins: 7 inches.
Dimensions of tail struts: Length, 12¼ inches; width, 2¾ inches: thickness, ⅛ inch.
Material of tail: Steel.
Type of filling: Type 98 explosive separately cast in the body and tail.
Weight of filling: 457.5 pounds.
Total weight of bomb: 1080 pounds.
Charge/weight ratio: 42 percent.

Construction of body: The body is of one piece machined steel construction. The after end of the body is threaded internally to receive the tail assembly.

The tail cone threads into the bomb body and is secured by two grub screws.

Construction of tail: Four 5/32-inch steel tail fins are spot welded to the tail cone. They are braced by a single set of box-type struts.

No. 6 Mk 1, Type 1 No. 6 Mk 1, and Type 4 No. 6 Mk 1 Bombs

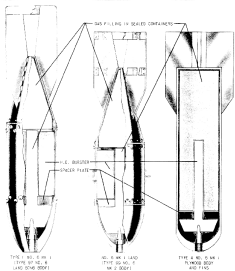
Fuzes: Both bombs are fuzed in the nose only, with standard Navy nose fuzing, without delay.

	Type 1 No. 6, Mk 1 Land	**No. 6 Mk 1 Land**
Over-all length	40 inches (less fuze).	42.21 inches (less fuze).
Length of body	21.8 inches	21.0 inches.
Diameter of body	7.85 inches	9.45 inches.

Color and markings: Gray over all with a green tipped nose and a yellow band aft of the green. Yellow band on the tail.
Type of filling: Mustard thickened with metha crylates and poly-vinyl alcohols.

	Type 1 No. 6, Mk 1 Land	**No. 6 Mk 1 Land**
Weight of filling (chemical).	18 kg. (approximate).	23 kg.
Total weight of bomb		69 kg.
Construction	Land type Type 97 No. 6, land body.	Type 99 No. 6 Mk 2. Body without multiple struts. Land type.

General description: The chemical fillings for these bombs are contained in cans which fit inside



TYPE 1 NO. 6 MK 1
(TYPE 97 NO. 6
LAND BOMB BODY)

NO. 6 MK 1 LAND
(TYPE 99 NO. 6
MK 2 BODY)

TYPE 4 NO. 6 MK 1
PLYWOOD BODY
AND FINS

Figure 46—No. 6 Mk 1, Type 1 No. 6 Mk 1, and Type 4 No. 6 Mk 1 Bombs

the bomb casing, and are sealed in place with paraffin. Two cans were used for each bomb; a conical can which fits into the tail cone, and a cylindrical can with a channel down its center to provide space for the central explosive burster charge. Besides the central burster charge, a nose charge is provided, separated from the forward end of the gas containers by a spacer disk. The nose charge is designed to have the effect of forcing the

spacer disk and chemical filling back out of the crater, and help to spread it.

Type 4 No. 6 Mk 1

General description: This bomb was designed to take the place of both of the improvised No. 6 Mk 1 land, and type 1 No. 6 Mk 1 land, bombs. It is of wooden construction throughout to save steel, and proves itself equal to the other two bombs in effectiveness in Japanese tests. Exact dimensions are not available, but the following data is known.

The barrel, nose section, and tail fins of the bomb are constructed of light plywood, molded into proper shape. A steel adapter is provided in the nose to take a standard Navy instantaneous fuze and gaine. The barrel of the bomb is cylindrical, with no cone at the tail. It is reinforced with bands of plywood. The tail fins are of standard shape, and are braced with steel struts. The nose section of the bomb is a wooden block, slightly rounded, and fitted into the barrel.

Chemical filling for the bomb is contained in a cylindrical can with a central pocket at its forward end to receive the central burster charge. At the forward end of the filling can is a spacer disk. An explosive nose charge is provided at the extreme forward end of the bomb and extends back through the spacer disk and into the central pocket in the chemical filling can. It is designed to prevent the chemical filling from collecting in the crater, and to spread it.

Remarks: These bombs are capable of being filled with any suitable gas, although the standard filling is mustard gas. According to Japanese statement, attempts by Japanese chemists to produce new types of gas failed to improve on types already in common production.

The Mk 1 bombs have never been recovered outside of the Japanese homeland, indicating that there was never any immediate intention of their use, and the small number of bombs of this type found in Japan indicates that the Japanese were inadequately prepared to initiate gas warfare.

The data on these bombs is the result of incomplete investigation, and must not be considered as specific, accurate information.

Type 99 No. 6 Mk 2 Bomb

Fuzes: A–3 (a).
Over-all length: 42 inches.
Length of body: 21 inches.
Diameter of body: 9⅜ inches.
Thickness of wall: 3/16 inches.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Two lugs. Normal Navy type.
Color and markings: Gray over all with a green tipped nose and a blue band aft of the green.
Length of tail: 21 inches.
Width of tail: 13¼ inches.
Width of tail fins: 6 inches.
Dimensions of tail struts: Outer struts: Length, 9½ inches; width, 1¾ inches; thickness, 1/16 inch. Inner struts: Length, 4¾ inches; width, 1¾ inches; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: Type 98 explosive.
Weight of filling: 85 pounds.
Total weight of bomb: 140 pounds.
Charge/weight ratio: 60 percent.

Construction of body: A cast-steel nose is attached to a tubular-steel body by a continuous circumferential weld and 2 rows of 16 plug welds. A tail cone is attached to a collar by a continuous circumferential weld and 16 plug welds. The

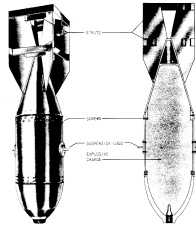


Figure 47—Type 99 No. 6 Mk 2 Bomb.

collar fits into the after end of the body and is held there by 2 rows of screws (16 per row).

Construction of tail: Four tail fins are welded to the tail cone and are braced by four sets of box-type struts.

Remarks: This bomb may be found with only one set of struts.

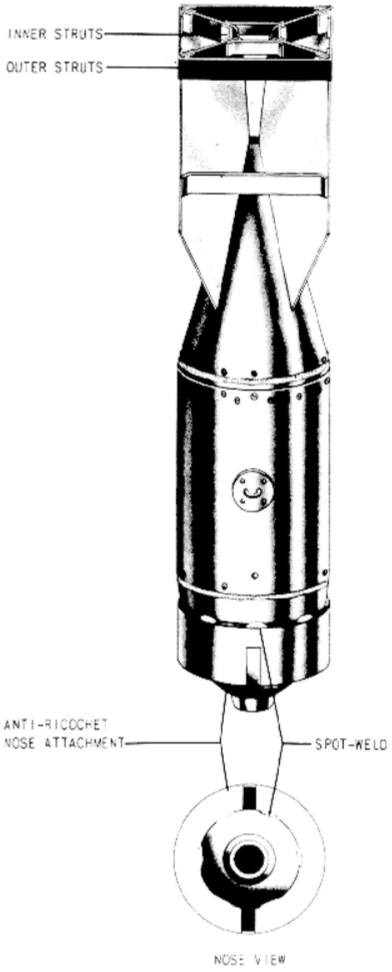


Figure 48—Type 99 No. 6 Mk 2 Bomb Modification 1.

Type 99 No. 6 Mk 2 Bomb Modification 1

Fuzes: A-3(a).
Over-all length: 42 inches.
Length of body: 21 inches.
Diameter of body: 9⅝ inches.
Thickness of wall: 5/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy type suspension lug.
Color and markings: Gray over all with a green tipped nose and a blue band just aft of the green.
Length of tail: 21 inches.
Width of tail: 13¼ inches.
Width of tail fins: 6 inches.
Dimensions of tail struts: Outer struts: 9½ inches x 1⅜ inches x 1/16 inch. Inner struts: 4¾ inches x 1⅜ inches x 1/16 inch.
Material of tail: Sheet steel.
Type of filling: Type 98 explosive.
Weight of filling: 85 pounds.
Total weight of bomb: 140 pounds.
Charge/weight ratio: 60 percent.

Construction of body: A cast-steel nose is attached to a tubular-steel body by a continuous circumferential weld and 2 rows of 16 plug welds. An antiricochet nose attachment consisting of a cylindrical metal ring ⅛ inch thick bent at a 90° angle is spot welded to the bomb at a point 1½ inches forward of the junction of the nose and body. The ring is 9⅝ inches in diameter and 3¾ inches long. There are two notches ⅞ inch wide and 2¼ inches deep cut into the forward edge of the ring 180° apart and in line with the suspension lug.

The tail cone is attached to a collar by a continuous circumferential weld and 16 plug welds. The collar fits into the after end of the body and is held there by 2 rows of 16 screws.

Construction of tail: Four tail fins are welded to the tail cone and are braced by four sets of box type tail struts.

Type 1 No. 25 Mk 2 Bomb Model 1

Fuzes: A-3 (a), B-3 (a).
Over-all length: 72 inches.
Length of body: 35½ inches.
Diameter of body: 13¾ inches.
Thickness of wall: ¼ incher.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy type suspension lug.

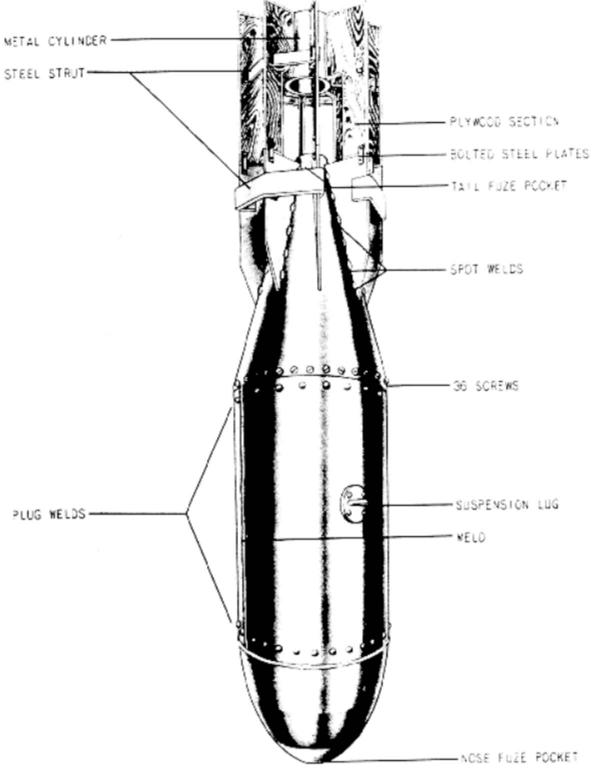


Figure 49—Type 1 No. 25 Mk 2 Bomb Model 1.

Color and markings: Gray over all with a green band forward of a blue band on the nose.

Length of tail: First section 21½ inches; extension, 15 inches.

Width of tail: 14 inches.

Width of tail fins: 5¼ inches.

Dimensions of tail struts: Forward struts: 5¼ inches x 2 inches x ⅛ inch; after struts: 5 inches x 1⅛ inches x ³⁄₁₆ inch.

Material of tail: First section, sheet steel; extension, plywood.

Type of filling: Type 98 explosive.

Weight of filling: 317 pounds.

Total weight of bomb: 572 pounds.

Charge/weight ratio: 56 percent.

Construction of body: A cast-steel nose is attached by a continuous circumferential weld and 16 plug welds to a longitudinally welded tubular steel body. A tail cone is attached to a collar

by 36 screws. The collar is held in the base of the bomb body by a single row of 16 plug welds.

Construction of tail: The tail is constructed in two sections, the first section has eight ⅛-inch sheet steel fins welded to the tail cone and supported by seven steel struts. The second section consists of eight-plywood fins in steel frames supported at their inner edges by a metal cylinder 4 inches in diameter and on their outer edges by seven steel struts. The second section is attached to the first by bolted steel plates on each of the eight fins. Apparently the wooden tail section is designed to come off on water impact.

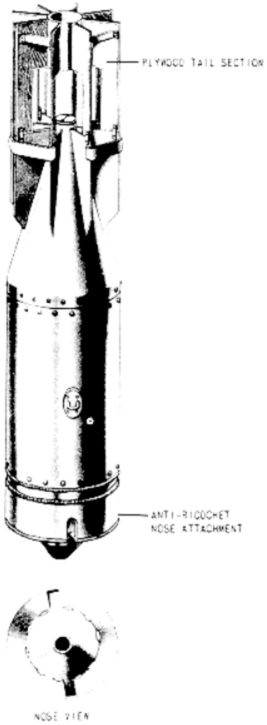


Figure 50—Type 1 No. 25 Mk 2 Bomb Model 1 Modification 1.

Type 1 No. 25 Mk 2 Bomb Model 1 Modification 1

Fuzes: A–3 (a), B–3 (a).
Over-all length: 72 inches.
Length of body: 35½ inches.
Diameter of body: 13¾ inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with a green band forward of a blue band on the nose.
Length of tail: First section, 21½ inches; extension, 15 inches.
Width of tail: 14 inches.
Width of tail fins: 5¼ inches.
Dimensions of tail struts: Forward struts: 5¼ inches x 2 inches x ⅜ inch. After struts: 5 inches x 1⅛ inches x 5/16 inch.
Material of tail: First section, sheet steel; extension, plywood.
Type of filling: Type 98 explosive.
Weight of filling: 317 pounds.
Total weight of bomb: 585 pounds.
Charge/weight ratio: 54 percent.

Construction of body: A cast-steel nose is attached by a continuous circumferential weld and 16 plug welds to a longitudinally welded tubular steel body.

An anti-ricochet attachment consisting of a metal ring and two supporting plates is welded to the bomb at a point 1¾ inches forward of the junction of the nose and body. The ring has a 13¾ inch diameter, is 5 inches long and 5/32 inch thick. The two semicircular supporting plates are welded to the interior of the forward end of the ring and to the nose of the bomb. There are two notches cut into the forward edge of the ring 180° apart. One notch is in line with the suspension lug. The supporting plates fail to meet by ⅞ inch at the two notches.

A tail cone is attached to a collar by 36 screws. The collar is held in the base of the bomb body by a single row of 16 plug welds.

Construction of tail: The tail is constructed in two sections: the first section has eight ⅛-inch sheet steel fins welded to the tail cone and supported by seven steel struts. The second section consists of eight plywood fins in steel frames supported at their inner edges by a metal cylinder 4

inches in diameter and on their outer edges by seven steel struts. The second section is attached to the first by bolted steel plates on each of the eight fins. Apparently the wooden tail section is designed to come off on water impact.

Type 99 No. 3 Mk 3 Bomb

Fuzes: Nose: A–1 (b), A–3 (c); Tail: Solid plug or D–2 (a), D–2 (b) or D–2 (c).
Over-all length: 24½ inches.
Length of body: 13¼ inches.
Diameter of body: 5¾ inches.
Thickness of wall: 3/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Two normal Navy suspension lugs diametrically opposed.
Color and markings: Gray body and tail. A 2-inch silver band around the nose, a 1-inch silver band on the end of the tail fins, and two red lines diametrically opposite run from nose to tail. New markings will be found.
Length of tail: 11 inches.
Width of tail: 6⅛ inches.
Width of tail fins: 1 11/16 inches.
Dimensions of tail struts: Length, 4⅛ inches; circumference, 3/16 inch.
Material of tail: Sheet steel.
Type of filling: Canister containing 168 phosphorus-filled steel pellets. Picric acid in tail cone and central burster charge.

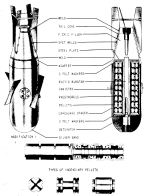


Figure 51—Type 99 No. 3 Mk 3 Bomb.

Weight of filling: Picric acid, 3.5 pounds.
Total weight of bomb: 70 pounds.

Construction of body: A cast-steel nose piece is circumferentially welded to a longitudinally welded steel body. A canister containing the incendiary pellets is fitted inside the body. A steel tube containing the central burster charge is screwed into the nose and extends the length of the body. A tail cone is circumferentially welded to a collar which threads into the after end of the body. The tail cone is filled with picric acid. A steel plate separates the explosive from the incendiary filler.

Construction of tail: Four steel fins are spot welded to the tail cone. They are braced by a single set of 3/16-inch round struts flattened at each end and riveted to the fins.

To impart the rotary motion necessary to arm the D–2 fuzes, the ends of the tail fins are bent to an angle of approximately 19°.

Remarks: A factory variation of the incendiary filling consists of 21 lengths of mild steel pipe, 1 inch in diameter, packed vertically in the canister. Each length is divided into 8 equal sections by being cut completely through except for ¼ inch of circumference left along 1 side. The bomb contained 168 phosphorus-filled pellets.

Modification 1: A variation of this bomb listed as Modification 1 has four fins welded to the body and utilizes the new color markings. The fins, which are 6 inches long, 1½ inches wide and 5/16 inch thick, are welded to the body at 4⅜-inch intervals, two between each suspension lug. They are offset 35° from the longitudinal axis of the bomb and serve to accelerate its clockwise rotation. The bomb is painted gray. It has a silver nose tipped with green. The tail struts are red

Type 3 No. 6 Mk 3 Bomb Model 1

Fuzes: D–2 series.
Over-all length: 40 inches.
Length of body: 23 inches.
Diameter of body: 7⅝ inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.

Color and markings: Silver nose tipped with a green band. Body is gray over all, except for red tail struts. Marked "Provisional designation type 3 No. 6 Mk 3 Model 1."
Length of tail: 17 inches.
Width of tail: 7⅞ inches.
Width of tail fins: 2½ inches.
Dimensions of tail struts: Length, 5 inches; width, 1½ inches; thickness, ⅛ inch.
Material of tail: Steel.
Type of filling: Three cylindrical steel canisters each containing 87 white phosphorus filled cylindrical steel pellets. Each canister has a central exploder tube filled with type 98 explosive. A heavy wax coating covers each canister.
Dimensions of filling:
  Length of canister: 4⅝ inches.
  Diameter of canister: 7¼ inches.
  Length of pellet: 1¼ inches.
  Diameter of pellet: 1⅛ inch.
  Diameter of exploder tube: 1 5/16 inch.
  Weight of individual canister: 24 pounds.
Weight of filling: 3 canisters, 72 pounds; tail cone charge, 11.2 pounds.
Total weight of bomb: 118 pounds.
Charge/weight ratio: 71 percent.

Construction of body: The bomb consists of a nosepiece, body and tail assembly. The conical-shaped nosepiece is welded to the body and has a steel plate welded where the fuze pocket would be. The cavity in the nosepiece is filled with a wooden block. The body is cylindrical in shape and is welded longitudinally. The tail cone is welded to a coupling ring which fits into the body and is held there by a single row of screws. A burster charge of cast type 98 explosive is contained in the tail cone. A perforated steel plate separates the explosive from the incendiary filling.

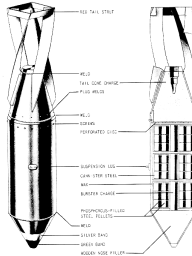


Figure 52—Type 3 No. 6 Mk 3 Bomb Model 1.

Construction of tail: The tail cone is welded longitudinally. Four angled fins are welded to the cone and braced by a single set of box-type struts. The angle of these fins imparts a counterclockwise rotation in flight to the bomb, thereby arming the clockwork fuze.

Operation: Upon release from the plane the aerial burst fuze functions initiating the tail cone charge which detonates the central burster tube. The bomb case and canisters are ruptured scattering the incendiary pellets. The white phosphorus is ignited when it is exposed to the air.

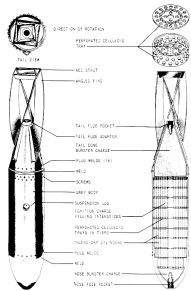


Figure 53—Type 2 No. 25 Mk 3 Bomb Model 1.

Type 2 No. 25 Mk 3 Bomb Model 1

Fuzes: Nose: A–3 (a); tail: D–2 (a).
Over-all length: 71 inches.
Length of body: 40 inches.
Diameter of body: 12 inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all. Silver nose tipped with green. Red tail struts.
Length of tail: 31 inches.
Width of tail: 12 inches.
Width of tail fins: 5¼ inches.
Dimensions of tail struts: Width, 2 inches.
Material of tail: Sheet steel.

Type of filling: Incendiary filling: 750 (approximate) steel cylinders containing an incendiary mixture.

Barium nitrate: 35.8 percent.
Iron oxide: 27.2 percent.
Aluminum powder: 13.6 percent.
Magnesium shavings: 10.3 percent.
Synthetic shavings: 13.1 percent.

Dimensions of cylinders: Length, 2¾ inches; width, 1⁵⁄₁₆ inches; thickness, ⅛ inch.

Packing of cylinders: The cylinders are packed in circular rows in nine perforated nitrocellulose containers.

Burster charges: Two burster charges are contained in the nose piece and in the tail cone. The explosive is also scattered throughout the interstices of each incendiary section. The composition of the charge is:

Barium nitrate: 75.2 percent.
Aluminum powder: 24.2 percent.
Oil: 2 percent.

NOTE.—Perforated steel plates in the nose and tail separate the burster charges and the incendiary filling.

Weight of filling: Burster charges, 73 pounds; incendiary filling, 300 pounds.
Total weight of bomb: 550 pounds.

Construction of body: A cast-steel nose is welded to a tubular-steel body by a continuous weld and a row of 12 plug welds. The tail cone is held by 1 row of 18 plug welds and a continuous weld to a collar which is held in the base of the bomb by 2 rows of round-headed screws, 20 in each row.

Construction of tail: Four steel fins are welded at an angle to the tail cone. The fins are braced at the juncture with the tail cone by a steel strip welded to the underside of the bent fin and the cone. At the after end the fins are braced by two sets of box-type struts. The angle of the fins imparts a counter clockwise rotation in flight to the bomb.

Operation: The aerial burst fuze functions at a preset height. The detonation of the burster charges ignites the inflammable trays and the incendiary cylinders and ruptures the bomb case. The fragments are scattered over a 175 yard radius when air-burst occurs 100 feet above ground.

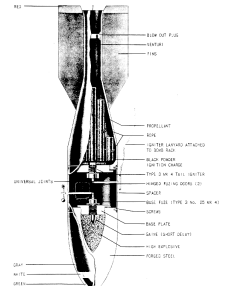


Figure 54—Type 3 No. 25 Mk 4 Bomb Modification 1.

Type 3 No. 25 Mk 4 Bomb Modification 1

Over-all length: 1.9 meters.
Weight of explosive: 3.5 kilograms.
Diameter: 0.3 meters.
Weight of propellant: 15.0 kilograms.
Maximum speed: 100 m./sec.
Total weight: 315 kilograms.

General description: Design work on this bomb was originally started in 1935, and produced the Basic 3 No. 25 Mk 4 bomb, which was used for all early Japanese Navy rocket testing and research. Production commenced on the type 3 bomb in 1943, and a reasonable number of the bombs had been produced or were in the process of production at the end of the war.

This bomb is an example of the early ideas on the use of rocket power. It is essentially an armor-piercing bomb, designed to utilize rocket power to increase penetration. However, as finally produced, the bomb had a maximum velocity of only 100 m./sec., and consequently was of little value.

The bomb consists of an armor piercing explosive nose section, a rocket motor tail section and a cylindrical center section joining the two, and carrying the fuzes for both sections. The armor piercing nose is of extremely heavy construction, and is fuzed in the base with a fuze incorporating a short delay. A very small explosive charge, approximately 3.5 kilograms in weight, is used as a burster. Type 91 explosive is used, as in all other Japanese Navy armor piercing ammunition. The rocket motor tail section constitutes about half of the over-all length of the bomb, and carries 15 kilograms of propellant of the ballistite type. It is fuzed at its forward end for ignition of the propellant, with a fuze which operates after the bomb leaves the plane. The tail section is equipped with standard fins for stabilization of the bomb in flight.

The cylindrical center section of the bomb has the function of joining the nose and tail sections and of carrying the fuzes for both. Both fuzes, situated at the center of the bomb are equipped with arming vane extensions which project out of the side of the bomb. Two hinged doors in the side of the bomb allow access to the fuzes.

The data on this bomb are the result of incomplete investigation, and must not be considered as specific, accurate information.

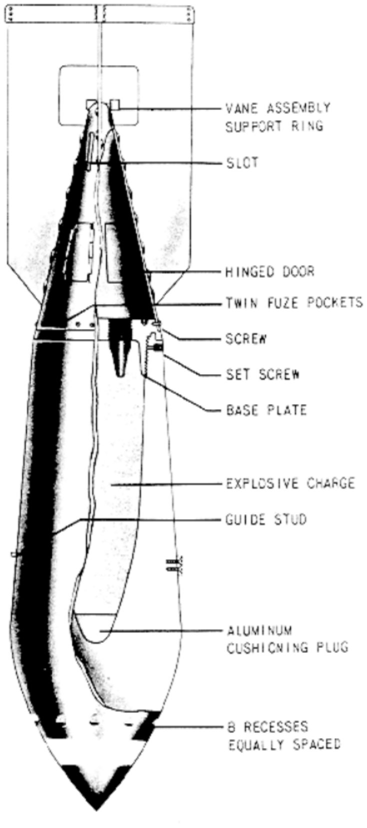


Figure 55—Type 99 No. 80 Mk 5 Bomb.

Type 99 No. 80 Mk 5 Bomb

Fuzes: Two B–2 (b) tail fuzes.
Over-all length: 95½ inches.
Length of body: 52⅛ inches.
Diameter of body: 16⅛ inches.
Thickness of wall: 4 inches (nose), 2 inches (tail).
Material of wall: Forged steel.
Type of suspension: Horizontal.

Suspension lug: Two guide studs on the bomb body, position a carrying band, to which a suspension lug is attached.
Color and markings: Gray over all. Green band around the nose, white band aft of green band.
Length of tail: 43⅜ inches.
Width of tail: 22⅛ inches.
Width of tail fins: 11$\frac{5}{16}$ inches.
Dimensions of tail struts: Length, 15¼ inches; width, 2¾ inches; thickness, $\frac{3}{16}$ inch.
Material of tail: Sheet steel.
Type of filling: Type 91 explosive (trinitroanisol).
Weight of filling: 66 pounds.
Total weight of bomb: 1,641 pounds (less tail).
Charge/weight ratio: 4.0 percent.

Construction of body: The bomb body is constructed of one piece of forged machined steel. There are eight recesses cut in the nose presumably to hold a windshield if the case is used as a projectile. A male base plate which has two fuze pockets is screwed into the after end of the body. The tail cone is formed of rolled sheet steel ($\frac{3}{32}$ inch) welded down one side. Twelve screws fasten the unreinforced base of the cone to the base plate of the bomb which has holes drilled around the edge to receive the screws. Three hinged doors in the cone permit access to the fuze pockets. Two vane assembly supporting rings are located at the apex of the cone. These rings are constructed to receive the B–2 (b) vane assembly bushings which are held in place by set screws. Slots in the tail cone are located beneath the supporting rings to permit passage of the reach rods from the fuze bodies to the vane assemblies.

Construction of tail: Four sheet-steel fins are spot welded to the tail cone and are braced by a single set of box-type struts.

Type 2 No. 80 Mk 5 and No. 150 Mk 5 Bombs

	Type 2 No. 80 Mk 5	No. 150 Mk. 5
Fuzes	2 B–2 (b) tail fuzes.	2 large fuzes similar to B–2 (b).
Gaines	Special Mk 5	Special Mk 5.
Approximate weight of bomb.	1,760 pound	3,300 pound.
Material of wall	Forged steel	Forged steel.
Material of tail	Sheet steel	Sheet steel.
Type of filling	Type 91	Type 91.
Approximate loading factor.	6 percent	6 percent.

Color and marking: Gray over all with green and brown nose band and white tail struts.

General description: These two bombs were designed to fill the great need of the Japanese Navy for armor-piercing bombs. Prior to the design of these two, the Japanese Navy had only one true armor-piercing bomb, the type 99 No. 80 Mk 5, an adaptation of a large caliber artillery shell produced by turning the shell down to a streamlined shape and adding a tail section and a slightly larger explosive charge. Type 2 No. 80 Mk 5 and No. 150 Mk 5, although they were specifically designed as armor-piercing bombs, differ only slightly from the earlier bomb. Type 2 No. 80 Mk 5 differs from type 99 No. 80 Mk5 only in having a slightly larger explosive charge, and in having no recesses at the nose to hold a windshield in place. No. 150 Mk 5 is simply a larger version of type 2 No. 80 Mk 5. Both bombs of the No. 80 size use two B–2 (b) fuzes in the tail with the special Mk 5 gaine. No. 150 Mk 5 has two large fuzes of similar construction to the B–2 (b).

These bombs were never extensively produced, and neither type 2 No. 80 Mk 5 or No. 150 Mk 5 was ever found outside the Japanese homeland.

The data on these bombs is the result of incomplete investigation, and must not be considered as specific, accurate information.

The Mk 7 bomb was never more than an idea as far as the Japanese Navy was concerned. It was suggested and discussed by a meeting of designers in 1935, but no experiments were carried out because the idea was considered impractical and unnecessary.

The bomb, as planned, was to consist of the 1 kilogram practice bomb, with a conical glass bottle of bacillus culture in place of the smoke mixture in the tail. A lengthened striker was to break the bottle, and the culture was to be spread by the force of impact. A spread of 1 meter diameter was hoped for. No specific type of bacillus had been selected for the bomb.

Distinctive color marking for the bomb was to have been purple painted nose and tail.

Type 5 No. 1 Mk 9 Model 1 and Type 3 No. 6 Mk 9 Bombs

	Type 5 No. 1 Mk 9 Model 1	Type 3 No. 6 Mk 9
Over-all length	35.4 inches	66.9 inches.
Diameter of body	3.93 inches	7.87 inches.
Weight of explosive	2.2 pounds	22 pounds.
Weight of propellant	4.4 pounds	22 pounds.
Total weight of bomb	33 pounds	184.8 pounds.
Maximum speed	230 m./sec	230 m./sec.

Color and markings: Gray over all. Green band on nose. Brown band just aft of green band. Gray tail struts.

General description: Neither of these rockets had been put into production at the end of the war, although experiments had been finished on both of them. Both were designed as aircraft launched weapons for use against surface targets; type 5 No. 1 Mk 9 Model 1, against surfaced submarines, and type 3 No. 6 Mk 9 against landing craft and small ships.

These rockets are similar to the Mk 27 and Mk 28 rockets of comparable sizes, but both are somewhat heavier. Both carry high explosive loads, and type 5 No. 1 Mk 9 Model 1 has a semiarmor piercing nose.

Exact fuzing is unknown, but it is known that type 5 No. 1 Mk 9 Model 1 uses a fuze with a 0–2 second delay. Type 3 No. 6 Mk 9 is assumed to use an instantaneous fuze.

Both of these rockets are fin stabilized, and more closely resemble American aircraft launched rockets than any of the other Japanese rockets. However, their small propellant charges result in such low speed that their performance in no way compares with that of the American rockets.

Type 98 No. 7 Mk 6 Bomb Model 1

Fuzes: (With magazine) A–3 (a), or A–3 (b).
Over-all length: 40 inches.
Length of body: 21¾ inches.
Diameter of body: 7⅞ inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.

Type of suspension: Horizontal.

Suspension lug: Normal Navy suspension lug.

Color and markings: Gray over all with a red nose band and red tail struts. New type color markings will be found.

Length of tail: $18\frac{3}{16}$ inches.

Width of tail: 10⅝ inches.

Material of tail: Sheet steel.

Dimensions of tail struts: Length, 7⅞ inches; width, 1⅜ inches; thickness, $\frac{3}{32}$ inch.

Type of filling: Four thermite-filled electron fire pots are contained within the bomb. The nose and tail fire pots are cylindrical, while the two in the body are semicircular. A central channel filled with quick match runs the length of the bomb. A black-powder charge is located in the circular recess in the nose piece.

Weight of filling: 81 pounds.

Total weight of bomb: 156 pounds.

Charge/weight ratio: 51 percent.

Construction of body: A cast-steel nose is riveted with 2 rows of 10 rivets each to a tubular-

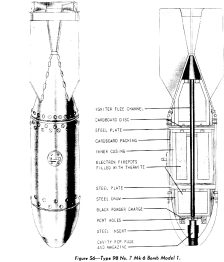


Figure 56—Type 98 No. 7 Mk 6 Bomb Model 1.

steel body. The tail cone is held by 1 row of 24 rivets to a collar which is held in the base of the bomb by 2 rows of screws (14 per row).

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single set of box-type struts.

Operation: On impact the magazine in the nose fuze fires the black powder and the igniting charge. The black powder ejects the fire pots from the bomb case. The igniting charge ignites the quick match which initiates combustion of the thermite.

Type 98 No. 7 Mk 6 Bomb Model 2

Fuzes: (With magazine) A–3 (a) or A–3 (b).
Over-all length: 42 inches.
Length of body: 21 inches.
Diameter of body: 9⅝ inches.
Thickness of wall: $\frac{3}{16}$ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Gray over all with two longitudinal diametrically opposite thin red lines. Red nose and red struts. New type markings will be found.
Length of tail: 21 inches.
Width of tail: 13¼ inches.
Width of tail fins: 6 inches.

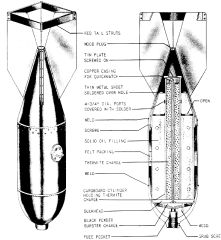


Figure 57—Type 98 No. 7 Mk 6 Bomb Model 2.

Dimensions of tail struts: Length, 9½ inches; width, 1⅜ inches; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: A central thermite core surrounded by solidified kerosene, petrol, alcohol-soap mixture.
Weight of filling: 20 pounds of inflammable mixture; 7.5 pounds thermite.
Total weight of bomb: 145 pounds.
Charge/weight ratio: 22 percent.

Construction of body: A cast-steel nose is attached to a tubular-steel body by a continuous circumferential weld and 2 rows of 16 plug welds each. A wood block and black powder burster charge are located in the nose. Housed within the body is a steel cylinder which contains the incendiary filling. A central copper tube within the cylinder contains quick match. A tail cone is attached to a collar by a continuous circumferential weld and 16 plug welds. The collar fits into the after end of the body and is held there by 2 rows of 16 screws each.

Construction of tail: Four steel fins are welded to metal strips which are riveted (14 rivets each) to the tail cone. The fins are braced by a single set of box-type struts.

Operation: On impact the magazine in the nose fuze fires the black-powder charge which shears off the tail cone and ejects the incendiary cylinder out of the bomb case. At the same time the quick match is ignited. This in turn sets fire to the thermite and the inflammable mixture.

Type 1 No. 7 Mk 6 Bomb Model 3
Modification 1

Fuzes: A–3(a).
Over-all length: 42¼ inches.
Length of body: 21 inches.
Diameter of body: 9⅝ inches.
Thickness of well: ⅛ inch.
Material of wall: Steel.
Type of suspension: Horizontal.

Suspension lug: Normal Navy type suspension lug.
Color and markings: Gray over all with a 3½-inch red band at the nose and red tail struts. New type markings will be found.
Length of tail: 21 inches.
Width of tail: 13¾ inches.
Width of tail fins: 6 inches.
Dimensions of tail struts: Length 9½ inches; width, 1⅜ inches; thickness, 1/16 inch.
Material of tail: Sheet steel.
Type of filling: 182 cylindrical incendiary pellets are arranged around a central cardboard tube. The pellets are bound together with string to form rings. The rings surround the central tube which is filled with gray powder. All the space in the bomb not occupied by the pellets is filled with this powder.
  Weight of individual pellets: 7 ounces.
  Total weight of pellets: 81 pounds.
  Length of pellets: 2⅜ inches.
  Diameter of pellets 1⅜ inches.
  Composition of pellets:
    35 percent barium nitrate.
    28 percent ferric oxide.
    18 percent aluminum.
    Remainder is synthetic rubber of polysulphide type resembling "thiokol."
  Weight of igniter powder, 30 pounds.
  Composition of igniter powder:
    75 percent barium nitrate.
    24.5 percent aluminum.
    0.3 percent oil.
    0.2 percent moisture.
Weight of filling: 111 pounds.
Total weight of bomb: 160 pounds.
Charge/weight ratio: 69.4 percent.

Construction of body: A cast-steel nosepiece is attached to a longitudinally welded steel body by a continuous circumferential weld. The nose contains a wooden block 1¾ inches thick to which a light metal gaine well is secured by three nails.

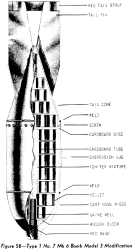


Figure 58—Type 1 No. 7 Mk 6 Bomb Model 3 Modification 1.

A longitudinally welded tail cone is welded to a collar which fits into the after end of the body and is held there by a single row of 16 screws.

Construction of tail: Four steel fins are spot welded to the tail cone. They are braced by a single set of box-type struts.

Remarks: Type 1 No. 7 Mk 6 Model 3: This bomb uses the same case as that described above but differs in the filling. It contains a high explosive burster charge in a central tube and an explosive filling of approximately 520 wedge-shaped rubber pellets impregnated with iron and aluminum.

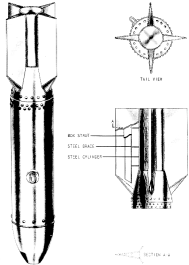


Figure 59—Type 3 No. 25 Mk 8 Bomb Model 1.

Type 3 No. 25 Mk 8 Bomb Model 1

Fuzes: A-3 (a).
Over-all length: 67 inches.
Length of body: 39⅝ inches.
Diameter of body: 12 inches.
Thickness of wall: ½ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.

Color and markings: Green band around the nose, brown band aft of green band. Gray body and tail.
Length of tail: 27⅜ inches.
Width of tail: 19⅜ inches.
Width of tail fins: 6⅜ inches.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: Type 97 explosive.
Weight of filling: 263 pounds.
Total weight of bomb: 649 pounds.
Charge/weight ratio: 40 percent.

Construction of body: A cast-steel nose is attached to a tubular-steel body by a continuous circumferential weld and 12 plug welds. A tail cone is held to a collar by 18 plug welds. The collars fits into the after end of the body and is held there by 40 screws.

Construction of tail: The normal tail cone has been cut off 8¾ inches aft of the junction with the bomb body proper and to this has been welded a ³⁄₁₆ inch steel cylinder and four ⅛ inch steel hollow tail fins.

Tail cylinder:
    Outside diameter: 5⅝ inches.
    Length: 18⅜ inches.
    Type of filling: Type 97 explosive.

Tail fins:
    Shape of cross-section: Triangular.
    Over-all length: 25½ inches.
    Height: 6⅜ inches.
    Width at base: 2½ inches.

Reinforcement of fins:

1. A box strut made of ⅛-inch mild steel runs the length of the fin on the inside. The box strut is ⅞-inch wide at the top and 1½-inches wide at the bottom, 1¾ inches high and 22 inches long. The strut is welded along the two lower edges to the side of the fins proper and spot welded along the sides.
2. Three ¼-inch mild steel braces, 1½ inches wide at the top, 2½ inches wide at the bottom and 2 inches high are welded at 5½-inch intervals to the box strut and the sides of the fins. The lower sides of these braces have been shaped to fit the cylinder.
3. The end of the fins is closed by a ¼-inch steel plate welded in place.

Type 2 No. 6 Mk 21 Bomb Model 1

Fuzes: D-4(a).
Over-all length: 41 inches.
Length of body: 38 inches (including nose piece).
Diameter of body: 9½ inches.
Thickness of wall: ¹⁄₁₆ inch.
Material of wall: Steel.
Type of suspension: Horizontal.

Suspension lug: Normal Navy type suspension lug.
Color and markings: Gray over all. One inch green band on nose. Brown band just aft of green band. Two ½ inch white bands on body mark position of binding straps.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: 40 1 kilogram high-explosive hollow charge bombs.
Weight of filling: 88 pounds.
Total weight of bomb: 132 pounds.
Charge/weight ratio: 66 percent.

Description: The canister consists of a blunt-nose assembly and a light tail piece, around which are fitted three steel segments held together by two circumferential metal retaining bands. Two steel wires, which are attached to the nose, run longitudinally along the canister and pass through the buckles of the bands locking them together. The buckles open automatically when the wires are withdrawn. The nose assembly is constructed of two pieces held together by four lead sealing strips. The forward piece is hollow and has a fuze pocket. The after piece contains a wooden disk. Set off center in the disk is a flat, round

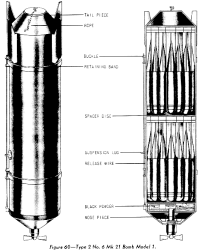


Figure 60—Type 2 No. 6 Mk 21 Bomb Model 1.

can housing a black powder burster charge in an annular silk bag. The eccentric position of the charge centers the ignition hole of the can directly under the fuze and places the main portion of the charge near to the point at which the two steel release wires are attached to the nosepiece. This accounts for a more direct pull being exerted on the release wires when the burster charge detonates.

Operation: Upon release from the plane the aerial burst fuze functions. The burster charge is fired shearing the lead sealing strips and blowing off the forward nosepiece. The nosepiece withdraws the release wires from the buckles of the retaining bands which frees the segments of the canister. The 1-kilogram bombs separate and fall individually.

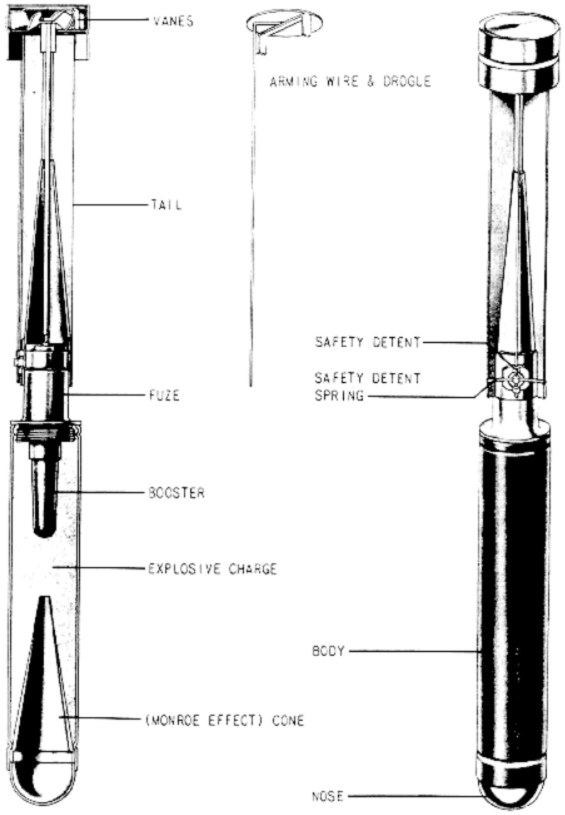


Figure 61—1-kg. Hollow-Charge Bomb.

1-kg. Hollow-Charge Bomb

Fuzes: B–5 (b).
Over-all length: 17½ inches.
Length of body: 8½ inches.
Diameter of body: 1¾ inches.
Thickness of wall: 1/16 inch.
Material of wall: Steel.
Type of suspension: Carried in clusters of 40 in a container.
Suspension lug: None.
Color and markings: Body is a natural steel color. The tail assembly is aluminum colored.
Length of tail: 9 inches (includes fuze).
Width of tail: 1¾ inches.
Dimensions of tail struts: Length, 1⅝ inches; diameter, 1¾ inches; thickness, 1/32 inch.

Material of tail: Light sheet tin.
Type of filling: Type 98 (TNT, 70 percent, HND, 30 percent). Tetryl booster.
Weight of filling: 11 ounces.
Total weight of bomb: 2 pounds 3 ounces (exclusive of nosepiece). Weight of tail assembly: 10 ounces; weight of body: 14 ounces.
Charge weight ratio: 31 percent.

Construction of body: The body is constructed of tubular steel. An aluminum nose cap and hollow metal cone are crimped into the nose. The fuze and tail assembly are threaded into the base of the body.

Construction of tail: Four fins are soldered to the tail cone and braced at the after end by a circular strut. The tail cone is secured to the fuze body by four small screws.

The arming system consists of arming vanes at the after end of the tail connected to the inertia weight by a threaded reach rod which passes through the tail cone. A spring loaded safety detent which fits into the inertia weight is located on the side of the tail cone and is held in the safe position by an arming wire. A thin metal disk attached to the arming wire is placed on top of the arming vanes. It prevents the vanes from rotating and acts as a drogue to withdraw the arming wire when the bomb is released.

Operation: When the bomb is released from the canister the pressure of the air on the drogue forces it from the bomb thereby withdrawing the arming wire. The safety detent spring ejects the safety detent. The vanes rotate and unscrew the reach rod from the inertia weight. The inertia weight and striker are then free to move forward on impact and hit the primer.

Type 2 No. 6 Mk 21 Bomb Model 2

Fuzes: D–4 (a).
Over-all length: 42¼ inches.
Length of body: 39 inches.
Diameter of body: 9½ inches.
Thickness of wall: 1/16 inch.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug is held in place by a steel plate that fits over it and is riveted to the body section.
Color and markings: Gray over all with a green-tipped nose and a brown nose band.
Length of tail: 3¼ inches.
Width of tail: 11 inches.
Width of tail fins: 2⅛ inches; length of tail fins, 8 inches.
Dimensions of tail struts: None.
Material of tail: 1/16 inch sheet steel.
Type of filling: 36 1-kilogram high-explosive bombs.
Weight of filling: 80 pounds.
Total weight of bomb: 109 pounds.
Charge/weight ratio: 72 percent.

Description: The hexagonally shaped bomb container consists of a blunt-nose assembly and a light tailpiece around which are fitted three sheet steel sections held together by three metal retaining bands. Two steel wires run longitudunally along the exterior of the container and pass through the three retaining band buckles. One wire is attached to the nosepiece; the other is a safety wire which is removed after the container has been placed in the bomb rack.

The nose section is of two-piece construction. The after piece is attached to the sheet-steel sides by a welded stud for each section. The forward piece is attached to the after one by three lead sealing strips. The nosepiece, which has a fuze pocket to take the D–4 (a) is filled by a wooden block. A round metal can containing the burster charge in an annular silk bag is set off-center in the wooden block. The initiating charge in the burster is directly beneath the fuze magazine. The balance of the charge is off-center toward the point where the retaining band release wire is secured to the nosepiece. The purpose of this offset is to exert a more direct pull on the release wire when the charge is detonated.

The tailpiece is held in place by a bungee cord fastened to a hook on the after end of each body section.

Two tail fins are riveted to the after portion of the sheet steel section to which the suspension lug is attached.

Two metal plates divide the container into three sections in each of which are packed 12 1-kilogram bombs.

Operation: After the bomb container is released from the plane, the aerial burst fuze functions. The burster charge shears the lead sealing strips between the two sections of the nose, blowing the outer piece free from the container and withdraw-

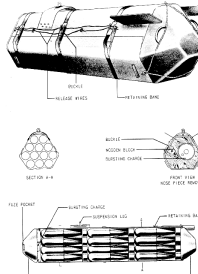


Figure 62—Type 2 No. 6 Mk 21 Bomb Model 2.

ing the release wire from the retaining band buckles. The retaining bands open and the container sections separate allowing the 36 1-kilogram bombs to fall individually.

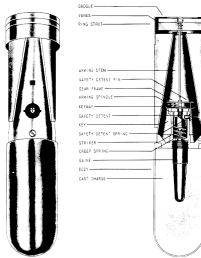


Figure 63—1-kg. Antipersonnel Bomb.

1-kg. Antipersonnel Bomb

Fuzes: B–5 (c).
Over-all length: 11⅜ inches.
Length of body: 5½ inches.
Diameter of body: 2¾ inches.
Thickness of wall: 3/32 inch.
Material of wall: Steel.

Type of suspension: Carried 36 in a container which is fuzed with a D–4 (a).

Suspension lug: None.

Color and markings: Bomb body may be steel gray or black. Tail assembly and fuze are aluminum colored.

Length of tail: 5⅞ inches.

Width of tail: 2¾ inches.
Width of tail fins: Approximately 1 inch at the widest point.
Dimensions of tail struts: Diameter, 2⅝ inches; length, 1⅜ inches.
Material of tail: Light tinned steel.
Type of filling: Type 97 (TNT, 60 percent; HND, 40 percent).
Weight of filling: 1 pound 1 ounce.
Total weight of bomb: 2 pounds 3 ounces.
Charge/weight ratio: 50 percent.

Construction of body: The body is of one piece light steel construction. It is cylindrical in shape, rounded at the nose and threaded in the base to receive the fuze assembly. The inside of the body is coated with lacquer.

Construction of tail: The tail assembly is made of light tinned steel and is secured to the fuze body by four screws. Four fins spaced 90° apart are soldered to the tail cone and are braced by a ring strut at the after end. An arming spindle extends from the fuze up through the tail cone, and has vanes attached at the end. A drogue holds the vanes in a safe position.

Operation: When the bomb falls free from the container, the drogue retaining the vanes is carried away by the wind, allowing the vanes to rotate. The motion of the vanes is transmitted through the reduction gear system to the spindle which is threaded out of the striker. To prevent rotation of the striker, a key and keyway system is incorporated in the fuze body and striker. As the spindle rises, it also lifts the gear frame to which is secured a pin retaining the safety detent. The safety detent, which fits through the fuze body into the striker and holds it in position, is spring loaded outward, and removal of the safety detent pin permits it to fly out. With the spindle and detent removed, the heavy striker is held up only by a weak creep spring, which it overcomes on impact, initiating the gaine.

Type 3 No. 6 Mk 23 Bomb Model 1

Fuzes: C-2(a).
Over-all length: 40¾ inches.
Length of body: 21¾ inches.
Diameter of body: 7⅞ inches.
Thickness of wall: ¼ inches.
Material of wall: Steel.
Type of suspension: Horizontal.

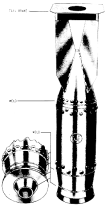


Figure 64—Type 3 No. 6 Mk 23 Bomb Model 1.

Suspension lug: Normal Navy type.
Color and markings: Old markings: Gray over all with a green band around nose. New type markings may be found.
Length of tail: 18½ inches
Width of tail: 10⅝ inches (excluding tail brake).
Width of tail fins: 4¾ inches.
Dimensions of tail struts: Length, 7⅝ inches; width, 1⅜ inches; thickness ³⁄₃₂ inch.
Material of tail: Sheet steel.
Type of filling: Picric acid or type 98 explosive.
Weight of filling: 50 pounds.
Total weight of bomb: 143 pounds.
Charge/weight ratio: 35 percent.

Construction of body: A cast-steel nose is attached by a continuous weld and 2 rows of 10 rivets each to a tubular-steel body. An anti-penetration ring is welded to the exterior of the nose 4 inches forward of the rivets. This ring is 2¾ inches long and has an outer diameter of 7⅞ inches.

A tail cone is held by 1 row of 24 rivets and a continuous weld to a collar which fits into the after end of the bomb body and is held there by 2 rows of screws (14 per row).

Construction of tail: Four fins are spot welded to the tail cone and braced by a single set of box-type struts. A ⅛ inch sheet steel tail brake measuring 10 inches square is welded to the after end of the tail fins.

Type 3 No. 6 Mk 27 Bomb (Rocket) Model 1

Over-all length: 53 inches.
Diameter of body: 7.8 inches.
Weight of load: 5.5 pounds.
Weight of propellant: 22.0 pounds.
Total weight: 145.2 pounds.
Maximum speed: 270 m./sec.
Color and markings: Gray overall with green and silver nose bands and red tail struts.

General description: This rocket, along with type 3 No. 1 Mk. 28 Model 1, were the only Japanese Navy rockets which were actually under production at the end of the war. It is an aircraft-launched rocket intended for use against formations of large enemy planes, designed to eventually take the place of type 99 No. 3 Mk. 3 for air to air bombing.

The bomb consists of three sections; nose, barrel, and tail. The nose section is conical in shape, with a fuze well in the nose and contains a burster charge, and a charge of incendiary shrapnel consisting of white phosphorus filled steel pellets. It is threaded onto the barrel, and secured in place with screws.

The barrel is cylindrical in shape, closed at the forward end, and serves as the container and burning chamber for the rocket propellant. It is fitted with one longitudinal launching rail.

The tail section is conical in shape, and is fitted with four fins of conventional Navy type. It is threaded onto the barrel, and secured in place with screws. The rear end is constricted to form a venturi for the escape of the driving gases.

The propellant is in grains 350 millimeters long and 19.2 millimeters in diameter, and is of the ballistite type, packed into the barrel. It is ignitied electrically.

The fuze used in this bomb is 10 second clockwork aerial burst fuze, using the standard Navy fuze clock, housed in a special brass case with a hand operated setting ring graduated in seconds from 0 to 10.

The data on this bomb is the result of incomplete investigation, and must not be considered as specific, accurate information.

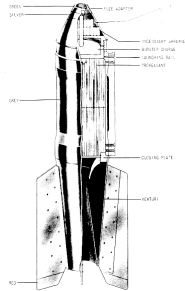


Figure 65—Type 3 No. 6 Mk 27 Bomb (Rocket) Model 1.

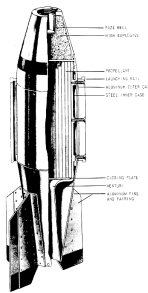


Figure 66—Type 3 No. 1 Mk 28 Bomb (Rocket) Model 1.

Type 3 No. 1 Mk 28 Bomb (Rocket) Model 1

Fuze: Type 3 Mk. 28.
Over-all length (less fuze): 25¾ inches.
Diameter of body: 4.69 inches.
Weight of explosive: 1.32 pounds.
Weight of propellant: 4.4 pounds.
Total weight: 19.8 pounds.
Color and markings: Gray over all with green and brown nose bands and red tail struts.

General description: In its early stages of development, this rocket was designated Mk 19. It is constructed of a light aluminum alloy and carries a high-explosive charge. It is intended for use against large aircraft.

Rocket power is supplied by 16 grains of ballistic type propellant 19.2 mm. × 350 mm. They are contained in the cylindrical barrel of the bomb, and are ignited electrically.

The nose section is ogival in shape, and carries the high-explosive charge. A nose well is provided to take a special small impact fuze similar to A–3(a).

The tail section is constricted to form a venturi, and is fitted with fins, riveted in place, for stabilization. An error of 10 meters at a range of 500 meters is assumed by designers.

Two launching rails, 180° opposed, are attached to the barrel of the bomb.

The data on this bomb is the result of incomplete investigation, and must not be considered as specific, accurate information.

Type 4 No. 25 Mk 29 Bomb

Type 4 No. 25 Mk 29 was in the process of being developed at the end of the war to take the place of the No. 25 Mk 3 bombs as a weapon for use against large bomber formations. It was designed either to be dropped in the same manner as the Mk 3 bombs, or to be detonated in the plane by the pilot. The bomb incorporates a larger explosive charge, and smaller quantity of incendiary shrapnel, than do the Mk 3 bombs of the same size.

The nose section of the bomb is conical in shape, and is filled with a wooden block except for a central channel filled with explosive leading into the main charge of the bomb. An adapter is supplied at the nose to receive the type 3 electric gaine.

The barrel of the bomb is cylindrical in shape, and is filled with incendiary shrapnel of the white phosphorus filled steel pipe type. A central burster charge of high explosive is surrounded by the incendiary shrapnel.

The conical tail section is filled with a central burster charge surrounded by the same type of incendiary shrapnel as is found in the barrel of the bomb. An adapter is provided at the apex of the tail cone to receive the type 99 Mk 3 tail fuze D–2 (a), without centrifugal arming. Tail fins are standard Navy design without rotational offset, such as is found in the Mk 3 bombs.

The bomb is fuzed in the nose with the type 3 electric gaine fitted with a cable which leads into a firing switch in the cockpit of the airplane. It is to be used when the pilot desires to fire the bomb in the airplane in a suicide attack on bomber formations.

The tail fuze is a type 99 Mk 3 without centrifugal arming. It is to be used when the bomb is dropped in an air to air bombing attack.

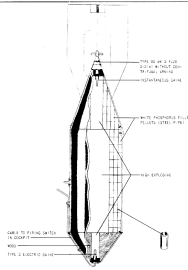


Figure 67—Type 4 No. 25 Mk 29 Bomb.

This bomb had not gone into production at the end of the war, but was considered by the Japanese to be a practical weapon for defense against heavy bombers.

The data on this bomb is the result of incomplete investigation, and must not be considered as specific, accurate information.

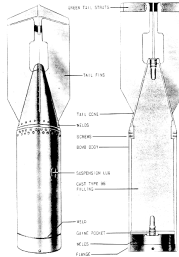


Figure 68—Type 3 No. 25 Mk 31 Bomb Model 1.

Type 3 No. 25 Mk 31 Bomb Model 1

Fuzes: Type 3 electric firing device B–3 (a).
Over-all length: 62 inches.
Length of body: 30⅜ inches.
Diameter of body: 11¾ inches.
Thickness of wall: ½ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Grey over all. Green tail struts. No color bands on nose.
Length of tail: 32 inches.
Width of tail: 16⅛ inches.
Width of tail fins: 7⅛ inches.

Dimensions of tail struts: Length, 13⅝ inches; width, 2¼ inches; thickness, 1/32 inch.
Material of tail: Steel.
Type of filling: Type 98 explosive, cast.
Weight of filling: 175 pounds.
Total weight of bomb: 378 pounds.
Charge/weight ratio: 33 percent.

Construction of body: The bomb consists of a nosepiece, barrel, and tail assembly.

The nose of the bomb is blunt. A flat metal plate is fitted into the forward end of the barrel and welded there. The plate is drilled centrally and a gaine pocket is welded in the hole. A flange 3⅞ inches long, 7/32 inch thick and of the same outer diameter as the barrel is welded to the forward end of the barrel. The flange is pierced by four ½-inch holes just aft of the forward end.

The barrel is of tubular steel construction.

The tail cone is held by 1 row of 18 plug welds and a continuous weld to a coupling ring which fits inside the barrel. The ring is held in the barrel by 2 rows of screws numbering 40 in all. There is a standard tail fuze pocket at the apex of the tail cone.

Construction of tail: Four Navy type fins are spot-welded to the tail cone. The fins are braced by a single set of box-type struts.

Operation: The type 3 electric firing device is an influence fuze, operated by a photo-electric cell, which is activated by reflection of a beam of light projected from the fuze, and reflected from the target. Aerial burst at an altitude of 7 meters or above was desired by the designers. Fifty percent accuracy was considered to have been attained.

Type 3 No. 80 Mk. 31 Bomb Model 1

Fuzes: Type 3 electric firing device, B–3 (b).
Over-all length: 113 inches.
Length of body: 72 inches.
Diameter of body: 18 inches.
Thickness of wall: 9/16 inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: 2 guide studs on the bomb body position the steel suspension band.
Color and markings: Gray over all. Green tail struts. No color bands on the nose.
Length of tail: 41 inches.
Width of tail: 25 inches.
Width of tail fins: 10½ inches.
Dimensions of tail struts: Length, 17¼ inches; width, 3⅜ inches; thickness, ⅛ inch.
Material of tail: Steel.
Type of filling: Type 98 explosive cast in paper-wrapped blocks.
Weight of filling: 922 pounds.
Total weight of bomb: 1,584 pounds.
Charge/weight ratio: 58 percent.

Construction of body: The bomb consists of a nose piece, barrel and tail assembly.

The slightly tapered longitudinally welded nosepiece is closed at its forward end by a flat plate which has an 11⅝-inch diameter. The plate is drilled centrally and this nose pocket can only accommodate a Navy gaine. A metal flange is welded to this plate. It is 5¼ inches long, 7/32 inch thick and has an 11⅜-inch inner diameter. It is pierced by four ½-inch holes ¾-inch aft of the forward end. The nose section is attached to the barrel by a continuous circumferential weld and 17 plug welds. There is a second circumferential weld at the point where the nose section begins to taper.

The barrel is of tubular-steel construction.

The tail cone is attached by 30 plug welds to a coupling ring which fits inside the barrel. The coupling ring is held in the barrel by 2 rows of screws numbering 34 in all. There is a standard tail fuze pocket at the apex of the tail cone.

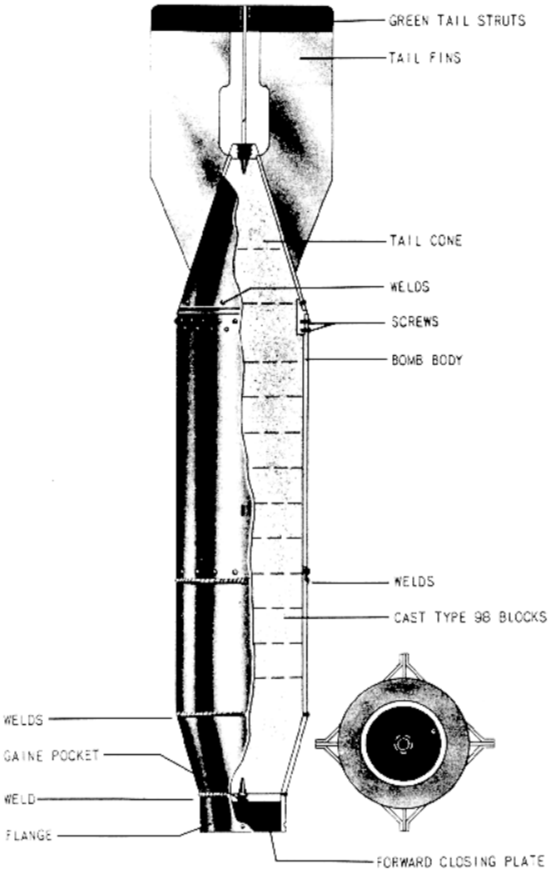


Figure 69—Type 3 No. 80 Mk 31 Bomb Model 1.

Four Navy type tail fins are welded to the tail cone. The fins are braced by a single set of box-type struts.

Remarks: The type 3 electric firing device is an influence fuze, operated by a photo-electric cell, which is activated by a beam of light projected from the fuze, and relfected from the target. Aerial burst at an altitude of 7 meters or above was desired by the designers. Fifty percent accuracy was considered to have been attained.

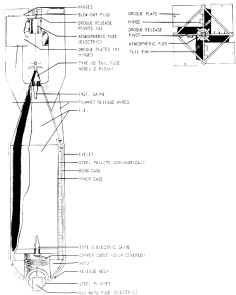


Figure 70—Type 5 No. 25 Mk 33 Bomb.

Type 5 No. 25 Mk 33 Bomb

This bomb is designed to detonate upon approach to the earth. It is a combination of a number of mechanical and electrical devices, all of which must operate if the bomb is to function properly. Proximity detonation is to be initiated through the action of an all-ways action electrical fuze contained in a plummet which falls ahead of the bomb in flight. An atmospheric fuze functions at the tail to open a set of four drogue plates at the tail, and release the nose plummet. A type 15 Model 2 tail fuze is provided to detonate the bomb in case of failure of either of the other fuzes.

The nose section contains a 20-kilogram spherical plummet housing an all-ways action electrical fuze, connected by 20 meters of silk clad copper cable to a type 3 electric gaine projecting into the main explosive charge of the bomb. The plummet is held in place in the nose of the bomb by two hinged latches held in the closed position by two steel wedges controlled, through wires, by the action of the tail drogue plates.

The barrel of the bomb is standard in construction, but added provision for fragmentation has been made by the addition of a layer of cylindrical steel pellets just under the case of the bomb.

The tail cone is standard with the type 15 Model 2 tail fuze (B–3(a)) in place at its apex.

The tail fin assembly is unique. It is designed to perform the function of slowing the fall of the bomb. It consists of a standard set of fins to which are hinged four rectangular drogue plates. These plates are hinged at their after end so that they may lie either flat against the fins or may be extended to serve as retarding plates. They are held in position flat against the fin surfaces by four pins which are in turn held in place by a blow-out plug. The blow-out plug is operated by an atmospheric fuze welded in place at the tail on the longitudinal axis of the bomb. The tail drogue plates operate the release mechanism for the nose plummet through two wires which run forward through eyelets on the outside of the barrel of the bomb.

When the bomb is dropped, the aneroid in the atmospheric tail fuze operates at the pre-set altitude, firing a squib electrically, which blows out the blow-out plug at the tail, allowing the drogue release pins to move, releasing the drogue plates. The plates assume an angle of 90° with the fin surfaces, and act to slow the fall of the bomb. Through the action of the plummet release wires, the plummet is released, and falls to the end of its cable. The all-ways action fuze in the plummet is armed by air travel, and operates through its cable and gaine to fire the main charge of the bomb upon striking the target. The type 15 Model 2 tail fuze operates in case of failure of the all-ways action nose fuze.

Both the atmospheric tail fuze and the all-ways action nose fuze carry their own electrical supply for firing in the form of self contained batteries.

The data on this bomb is the result of incomplete investigation, and must not be considered as specific, accurate information.

1-kg. Practice Bomb Modification 2 and Modification 3

Fuzes: A–5 (a).
Over-all length: 10¼ inches.
Length of body: 2¾ inches.
Diameter of body: 3 inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel.

Type of suspension: Horizontal.
Suspension lug: A rectangular hinged steel lug on a plate riveted to the body with four rivets.
Color and markings: White rubber nose, black body, white tail cone and fins. Brass band just aft of rubber nose.
Length of tail: 7⅜ inches.
Width of tail fins: 1¼ inches.
Width of tail: 3½ inches.
Dimensions of tail struts: None.
Material of tail: Sheet metal.
Type of filling: Picric burster and a red or white phosphorus main charge.
Weight of filling: 3 ounces (approximately).
Total weight of bomb: 2 pounds 3 ounces.
Charge/weight ratio: 9 percent.

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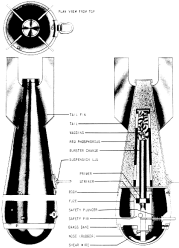


Figure 71—1-kg. Practice Bomb Modification 2 and Modification 3.

Construction of body: A hemispherical rubber nosepiece is attached by screws to the forward end of the one-piece, cast-iron body. The bomb fuze is contained in the nose and body. A burster charge is attached to the after end of the fuze and extends into the tail cone which is held to the bomb body by five screws. The burster charge is surrounded by cotton wadding which is contained in a central tube. The remaining space in the tail cone is filled with red or white phosphorus. A safety plunger is depressed when the bomb is loaded in the bomb rack. A screw type safety pin is removed when the bomb is in the bomb rack.

Construction of tail: Four fins are welded to the sheet metal tail cone. There are no tail struts.

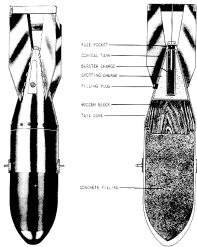


Figure 72—No. 3 Practice Bomb Model 1.

No. 3 Practice Bomb Model 1

Fuzes: B–6 (a).
Over-all length: 33¾ inches.
Length of body: $16\frac{15}{16}$ inches.
Diameter of body: 7 inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: 2 normal Navy suspension lugs 180° apart.
Color and markings: The body forward of the suspension lugs is black. Aft of lugs, the bomb is white. Two red lines 90° on either side of the suspension lugs run the length of the body and tail cone. New color markings will be found.

Length of tail: 17¾ inches.
Width of tail: 9½ inches.
Width of tail fins: 4 inches; thickness, 1/16 inch.
Dimensions of tail struts: Length, 6⅞ inches; width, 1 3/16 inches; thickness, 3/16 inch.
Material of tail: Steel.
Type of filling: Concrete in nose and body. Titanium tetrachloride and picric burster charge in tail cone.
Total weight of bomb: 68 pounds.

Construction of body: The nose and body are constructed of one piece of machined steel. The sheet steel tail cone is attached to the after end of the body by screws. The nose and body are concrete filled. A wooden block fills the lower part of the tail cone and a conical steel tank containing a spotting charge of titanium tetrachloride and a picric burster fits into the apex of the cone. Four slots in the tail cone allow the smoke to escape when the burster charge ruptures the metal container.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single set of box type tail struts.

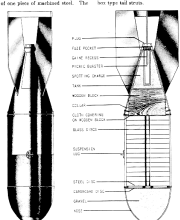


Figure 73—Type 99 No. 3 Practice Bomb.

Type 99 No. 3 Practice Bomb

Fuzes: B–6 (a).
Over-all length: 35¾ inches.
Length of body: 19⅛ inches.
Diameter of body: 7 inches.
Thickness of wall: ¼ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: The forward half of the bomb is painted black and has a green band around the nose. The after half, including the tail cone, fins, and struts, is painted white.
Length of tail: 16¼ inches.
Width of tail: 9½ inches.
Width of tail fins: 4 inches.
Dimensions of tail struts: Length, 6⅞ inches; width, 1 3/16 inches; thickness, 1/16 inch.
Material of tail: Steel.
Type of filling: The nose is filled with fine gravel held in place by a steel separating plate. The body contains 15 glass disks 6½ inches in diameter and ¼ inch thick. A spotting charge of titanium tetrachloride and a picric burster are contained in a tank in the apex of the tail cone. A wooden block fills the remainder of the cone.
Total weight of bomb: 72 pounds.

Construction of body: The bomb is of three-piece construction. A steel nosepiece is attached to a tubular-steel body by screws. A tail cone is attached to a collar by screws. The collar fits into the after end of the body and is held there by screws. Four slots in the tail cone allow the smoke to escape when the burster charge ruptures the metal tank.

Construction of tail: Four steel fins are welded to the tail cone and are braced by a single set of box type tail struts.

Remarks: The purpose of the glass disk filling in practice bombs is to lessen the damage to the target ship while still preserving the correct trajectory and ballistics of the bomb.

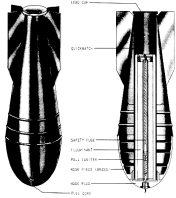


Figure 74—Type 96 Landing Flare.

Type 96 Landing Flare

Fuzes: Pull igniter.
Over-all length: 16⅝ inches.
Length of body: 16⅜ inches.
Diameter of body: 5⅜ inches.
Thickness of wall: Nosepiece, ⅛ inch; body, 3/32 inch.
Material of wall: Brass nose, sheet steel body.
Type of suspension: Hand thrown.
Suspension lug: None.
Color and markings: Grey over all.
Length of tail: 6¾ inches-
Width of tail: 5¼ inches.
Width of tail fins: 1⅜ inches.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: Illuminant.
Weight of filling: 1 pound.
Total weight of bomb: 6 pounds.

Description: A brass nosepiece, ogival in shape is brazed to a conical body. A brass plug screws into the nose of the flare. It is threaded internally to hold a central tube containing the pull igniter, delay train, and illuminant. The after end of the flare is closed by a lead cap.

Four fins are soldered to the after end of the body.

Operation: The igniter cord is pulled firing the primer which ignites the delay train.

This in turn ignites the quick match which fires the illuminant. The heat melts the lead cap and the flame escapes through this hole.

The flares burns for 3 to 5 minutes.

Landing Flare

Fuzes: Pull igniter.
Over-all length: $22\frac{3}{16}$ inches.
Length of body: $15\frac{1}{16}$ inches.
Diameter of body: $6\frac{1}{4}$ inches.
Thickness of wall: $\frac{1}{32}$ inch.
Material of wall: Sheet steel.
Type of suspension: Launched by hand.
Suspension lug: Two handles held flush against the case by springs are riveted to the body.
Color and markings: Grey. Label just below carrying handles reads: "Manufacturing Date—September 1940. Naval Aerial Factory Illuminating Flare Bomb."
Length of tail: $7\frac{1}{8}$ inches.
Width of tail: 10 inches.
Width of tail fins: $2\frac{1}{4}$ inches.
Dimensions of tail struts: None.
Material of tail: Steel.
Type of filling: Illuminant.
Weight of filling: $5\frac{1}{4}$ pounds.

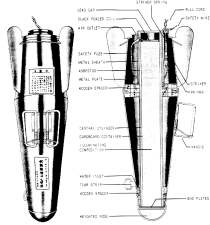


Figure 75—Landing Flare.

Total weight of bomb: 13 pounds (approximate).
Charge/weight ratio: 39 percent.

Construction of body: Consists of three distinct parts—nose, body, and tail. Nose is a solid metal weight which is hemispherical in shape. It is welded to the body. The body is of sheet-metal construction and conical in shape. It is welded to the nose and secured to the tail portion by eight small screws. On the exterior of the body is a tear strip which covers a small water inlet hole. Inside the body is a long central tube which extends the full length of the flare. This tube contains the illuminating composition. It is held in place by a large wooden spacer disk situated at the junction of the body and the tail with another wooden spacer at the junction of the body and the nose. Spacers are held in place by small screws, six at the nose and eight at the tail.

Construction of tail: Constructed of light sheet metal with 4 fins soldered to it. A metal cap is soldered over the end of the tail and fits around the central cylinder. There is a small air outlet in the cap. A percussion igniter is inserted through a hole in the cap and soldered into position. Over the end of the central cylinder is a lead cap which is soldered to the end cap. This lead cap has a central disk of the same metal but much thinner. Central cylinder is surrounded by an asbestos liner covered by a metal sheath. This extends down to the wooden spacer, also covered by a metal disk.

Operation: Before dropping, remove tear strip and safety wire and pull the igniter cord. When catch has been pulled out approximately ¾ inch, the spring-loaded striker is released. The striker then impinges on the primer. A 10-inch safety fuze is ignited by the flash from the cap and after burning for 35 seconds the safety fuze ignites a coil of black powder. Resultant heat melts lead cap allowing flash to escape. Illuminant burns rapidly with brilliant greenish-white flame which lasts approximately 1 minute and 20 seconds.

5-kg. Parachute Flare Model 2 Modification 1

Fuzes: Pull igniter.
Over-all length: 25⅛ inches.
Diameter: 3⅛ inches.
Material of wall: Light sheet steel.
Type of suspension: None. Thrown by hand from plane.
Color and markings: Body is grey over all. Two labels give description and instructions for use.
Type of filling: Illuminant.
Weight of filling: 5 pound 8 ounces.
Composition of illuminant:
  Barium nitrate: 55.5 percent.
  Aluminum, powdered: 11.0 percent.
  Magnesium, powdered: 18.0 percent.
  Wax: 9.10 percent.

Total weight of flare: 10 pounds ¾ ounce.

Construction: The flare case is cylindrical and of light sheet steel construction. It contains an illuminating candle unit and a parachute, and is closed at both ends by metal caps. The cap on the parachute end may be removed by pulling a tear strip.

The illuminating candle unit container is cylindrical in shape and is made of corrugated sheet tin. A copper tube extends the length of the unit and the illuminant is cast around it. A wooden plug is fitted into the top of the flare and is held there by a metal cap and several screws. The fuze is inserted in a hole in the plug and fits down into the copper tube. Four black powder impregnated strips are attached to the fuze and extend down the copper tube to the base of the illuminant. Similar black powder strips are cast in the bottom of the flare. A wooden ring in the base of the candle unit holds it away from the bottom of the flare containers.

The fuze used is of the pull igniter type. A tin cylinder fits over the end of the fuze and extends up through the parachute to the end cap. The pull cord attached to the catch on the fuze is led up through the tin cylinder to the end cap.

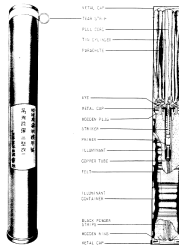


Figure 76—5-kg. Parachute Flare Model 2 Modification 1.

The parachute is made of silk and is attached to the candle unit by a length of wire rope. The wire rope is spliced and the two ends are attached to two eyes fastened to the wooden plug in the end of the illuminant container.

Operation: The tear strip is pulled and the end cap removed. Then the igniter cord is pulled and the flare is thrown from the plane. The striker in the fuze hits the primer which ignites the powder train. This burns slowly down to the black powder strings cast in the base of the illuminant, igniting the illuminant. The expanding gases expel the candle unit and the parachute from the container. The unit burns for approximately 1 minute and 30 seconds giving off a brilliant white flame.

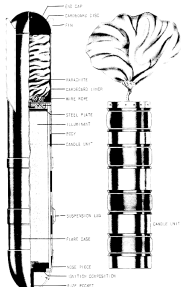


Figure 77—Type 0 Parachute Flares Model 1 and Model 1 Modification 1

Type 0 Parachute Flares Model 1 and Model 1 Modification 1

Fuzes: D–3 (a), D–4 (a).
Over-all length: 42½ inches.
Length of body: 39½ inches.
Diameter of body: 6¾ inches.
Thickness of wall: 3/64 inch.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Model 1: Grey over all with a ¼ inch red stripe just below the end piece. Model 1 Modification 1: Grey over all with a ¼ inch red stripe just above the end piece and a ½ inch white stripe around the body.
Length of Tail Fins: 14¾ inches.
Width of tail fins: 1 13/16 inches.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: Illuminant (silver-grey in appearance).
Weight of filling: 66 pounds.
Total weight of bomb: Model 1: 84 pounds. Model 1 Modification 1: 88 pounds.

Construction: The flare consists of three main elements: (1) the flare case, (2) the illuminating candle unit, (3) the parachute.

1. The flare case consists of three sections: a nosepiece, body, and end cap. The nosepiece is soldered securely to the body, and the hemispherical end cap is held in position by spot soldering in four places. Four tail fins are welded to the after two-fifths of the body. A steel ring 1 inch wide fits around the body at its junction with the tail cone. It is attached to the fins and serves to brace them as well as to retard the velocity of the flare's free fall. The nose is threaded to receive the fuze.

2. The illuminant is contained in a cardboard canister which is covered by sheet brass 0.025 inch thick. The after end is closed by a steel plate held by screws to the cylinder. A ¼ inch wire rope 65 inches long from which the candle unit is suspended is attached to this steel plate by means of a shackle. The forward end of the container is open and fits against a wooden block in the nosepiece. The illuminant at the opened end contains in its center an ignition charge 3 inches in diameter and ¼ inch thick.

Length of illuminant container: 26 inches.
Length of illuminant: 24½ inches.
Diameter of illuminant: 5½ inches.

3. Model 1: A single silk parachute is housed in the after end of the body. It is surrounded by a layer of cardboard to insure smooth ejection.

Model 1 Modification 1: A small guide parachute and a larger parachute are housed in the after end of the body. They are surrounded by a layer of cardboard to insure smooth ejection.

Operation: Shortly after being released from the plane the aerial burst fuze operates. The resultant flash from the magazine ignites the ignition charge which in turn ignites the illuminant. The expanding gases force the end cap off and eject the parachute and illuminating candle unit. The flare sheds a bright white light and burns for 3 minutes and 40 seconds.

Type 0 Parachute Flares Model 2 and Model 3 Modification 1

Fuzes: D–3 (a), D–4 (a).

	Model 2	Model 3 Modification 1
Over-all length	38½ inches	42½ inches.
Length of body	35½ inches	39½ inches.
Diameter of body	6¾ inches	6¾ inches.
Thickness of wall	3/64 inch	3/64 inch.

Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and marking: Model 2: Grey over all with a ¼ inch red stripe above the end piece. Model 3 Modification 1: Grey over all with a black stripe around the nose and a ¼ inch red stripe above the end piece.

	Model 2	Model 3 Modification 1
Length of tail fins	13½ inches	15 inches.
Dimensions of tail struts.	None	----------------
Material of tail	Sheet steel	----------------
Type of filling	Illuminant	----------------
Weight of filling	66 pounds	----------------
Total weight of bomb	84 pounds	88 pounds.

Construction of body: The flare consists of three main elements: (1) the flare case, (2) the illuminating candle unit, (3) the parachute.

1. The flare case consists of three sections: a nose piece, body and end cap. The nose piece is soldered securely to the body, and the hemispherical end cap is held in position by spot soldering in four places. Four tail fins are welded to the after two-fifths of the body. A steel ring 1 inch wide fits around the body at its junction with the tail cone. It is attached to the fins and serves to brace them as well as to retard the velocity of the

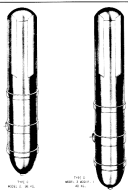


Figure 78—Type 0 Parachute Flares Model 2 and Model 3 Modification 1.

flare's free fall. The nose is threaded to receive the fuze.

2. The illuminant is contained in a cardboard canister which is covered by sheet brass 0.025 inch thick. The after end is closed by a steel plate held by screws to the cylinder. A ¼-inch wire rope 65 inches long from which the candle unit is suspended is attached to this steel plate by means of a shackle. The forward end of the container is open and fits against a wooden block in the nose piece. The illuminant at the open end contains in its center an ignition charge 3 inches in diameter and ¼ inch thick.

Length of illuminant container: 26 inches.
Length of illuminant: 24½ inches.
Diameter of illuminant: 5½ inches.

3. Model 2: A single silk parachute is housed in the after end of the body. It is surrounded by a layer of cardboard to insure smooth ejection.

Model 3 Modification 1: A small guide parachute and a larger parachute are housed in the after end of the body. They are surrounded by a layer of cardboard to insure smooth ejection.

Operation: Shortly after being released from the plane the aerial burst fuze operates. The resultant flash from the magazine ignites the ignition charge which in turn ignites the illuminant. The expanding gases force the end cap off and eject the parachute and illuminating candle unit. The flare sheds a bright white light and burns for 3 minutes and 40 seconds.

OGIVAL EXPERIMENTAL MODEL 11, 50 KG.

CONICAL EXPERIMENTAL MODEL 11, 40 KG.

Figure 79—Experimental Model 11 Parachute Flares.

Experimental Model 11 Parachute Flares

Fuzes: D–3 (a), D–4 (a).

	Model 11 Conical	Model 11 Ogival
Overall length	45 inches	46½ inches.
Length of body	43½ inches	43½ inches.
Diameter of body	9¼ inches	9¼ inches.
Thickness of wall	$\frac{3}{64}$ inch	$\frac{3}{64}$ inch.

Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Grey over all with a ¼ inch red stripe above the end piece.
Length of tail fins: 13¾ inches.
Dimensions of tail struts: None.
Material of tail: Sheet steel.
Type of filling: Illuminant.
Weight of filling: 68 pounds

	Model 11 Conical	Model 11 Ogival
Total weight of bomb.	106 pounds	110 pounds.

Construction of body: The flare consists of three main elements: (1) the flare case, (2) the illuminating candle unit, (3) the parachute.

1. The flare case consists of three sections: a nosepiece, body, and end cap. The nosepiece is soldered securely to the body, and the hemispherical end cap is held in position by spot soldering in four places. Four tail fins are welded to the after two-fifths of the body. A steel ring 1 inch wide fits around the body at its junction with the tail cone. It is attached to the fins and serves to brace them as well as to retard the velocity of the flare's free fall. The nose is threaded to receive the fuze.

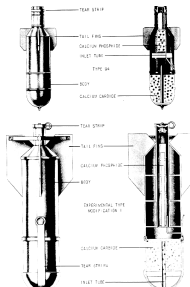


Figure 80—Type 94 and Experimental Type Modification 1 Float Lights.

2. The illuminant is contained in a cardboard canister which is covered by sheet brass 0.025 inch thick. The after end is closed by a steel plate held by screws to the cylinder. A ¼ inch wire rope 65 inches long from which the candle unit is suspended is attached to this steel plate by means of a shackle. The forward end of the container is open and fits against a wooden block in the nose piece. The illuminant at the open end contains in its center an ignition charge 3 inches in diameter and 1/4 inch thick.

Length of illuminant container: 25¾ inches.
Length of illuminant: 23¾. inches.
Diameter of illuminant: 7¾ inches.

3. A small guide parachute and a larger parachute are housed in the after end of the body. They are surrounded by a layer of cardboard which insures smooth ejection.

Operation: Shortly after being released from the plane the aerial burst fuze operates. The resultant flash from the magazine ignites the ignition charge which in turn ignites the illuminant. The expanding gases force the end cap off and eject the parachute and illuminating candle unit. The flare sheds a bright white light and burns for 4 minutes 40 seconds.

Type 94 and Experimental Type Modification 1 Float Lights

Fuzes: None.	Type 94	Experimental type, Modification 1
Over-all length	11 7/16 inches	21¾ inches.
Length of body	11 7/16 inches	21¾ inches.
Diameter of body	2 13/16 inches	4¾ inches.
Thickness of wall	3/64 inch	5/64 inch.
Material of wall	Tin plate	Tin plate.
Type of suspension	None	None.
Suspension lug	None	None.
Color and markings	Grey. Red pull rings. One paper label.	Chrome yellow. Red pull rings. Two paper labels.
Length of tail fins	2¼ inches	7 inches.
Width of tail	3 inches	5 inches.
Width of tail fins	1¾ inches	2¾ inches.
Dimensions of tail struts.	None	5 inches by ¾ inch by 1/32 inch.
Material of tail	Tin plate	Tin plate.
Type of filling	Calcium carbide and Calcium phosphide.	
Weight of filling	Calcium carbide, 0.5 pound.	Calcium carbide, 2.0 pounds.
Total weight of bomb	2.2 pounds	6.6 pounds.
Charge/weight ratio	23 percent	33 percent.

Construction of body: In both types the body is constructed of tin plate rolled into a cylinder with soldered lapped joints. The hemispherical nosepiece and conical tail piece are soldered to the body. The nosepiece houses a lead weight. The calcium carbide is contained in the forward part of the body, the calcium phosphide in the after part. Two metal tear strips cover water inlet holes in the nose and tail.

Construction of tail: Four steel fins are soldered to the body and tail cone. There are no struts on type 94. The fins on the experimental type are braced by a single set of box-type struts.

Operation: The tear strips are removed before dropping. On impact with the water, the water enters the holes formerly covered by the tear strips. Water reacts with calcium phosphide to generate phosphine and calcium carbide to generate acetylene gas. On contact with the air phosphine ignites spontaneously and the resultant flame is fed by the acetylene which acts as the main source of fuel.

Figure 81—Type 94 Model 2 and Type 0 Model 1 Float Lights.

Type 94 Model 2 and Type 0 Model 1 Float Lights

Fuzes: None.

	Type 94 Model 2	Type 0 Model 1
Over-all length	10 inches	$13\frac{13}{16}$ inches.
Length of body	10 inches	$12\frac{13}{16}$ inches.
Diameter of body	$2\frac{11}{32}$ inches	$2\frac{7}{8}$ inches.
Thickness of wall	$\frac{3}{64}$ inch	$\frac{3}{64}$ inch.

Material of wall: Tin plate.
Type of suspension: None.
Suspension lug: None.
Color and markings: Grey over-all with two labels pasted on body.

	Type 94 Model 2	Type 0 Model 1
Length of tail fins	$3\frac{3}{4}$ inches	$4\frac{1}{8}$ inches.
Width of tail fins	1 inch	$1\frac{5}{8}$ inches.
Dimensions of tail struts	None	Length, $3\frac{1}{8}$ inches; width, $\frac{1}{4}$ inch; thickness, $\frac{1}{32}$ inch.

Material of tail: Tin plate.
Type of filling: Calcium carbide and calcium phosphide.

Construction of body: In both types the body is constructed of tin plate rolled into a cylinder with soldered lapped joints. The ogival nosepiece and conical tailpiece are soldered to the body. The nosepiece houses a lead weight. The calcium carbide is contained in the forward part of the body, the calcium phosphide in the after part.

Two metal tear strips cover water inlet holes in the nose and tail.

Construction of tail: Type 94 Model 2: Three tail fins are soldered to the tail cone. There are no struts. Type 0 Model 1: Four tail fins are soldered to the body and tail cone and are braced by a single set of box-type struts.

Operation: The tear strips are removed before dropping. On impact with the water, the water enters the holes formerly covered by the tear strips. Water reacts with calcium phosphide to generate phosphine and calcium carbide to generate acetylene gas. On contact with the air phosphine ignites spontaneously and the resultant flame is fed by the acetylene which acts as the main source of fuel.

Remarks: The Type 0 Model 1 float light has a deflector on the exterior of the nosepiece which prevents it from penetrating too deeply into the water.

2-kg. Smoke Float

Fuzes: Pull igniter.
Over-all length: 18⅛ inches.
Diameter of body: 4¾ inches.
Color and markings: White except for yellow nose.
Total weight: 4¾ pounds.
Suspension: Thrown by hand.

Description: A cast-brass nosepiece weighted with lead is soldered to a conical body of 22 gage sheet metal. A smoke candle unit screws into the nose. An emission tube, supported by three metal disks, passes lengthwise through the center of the body and has a cork plug in the tail end. Three rounded tail fins are soldered around the after end of the body.

The smoke candle unit consists of a casing of light alloy containing a smoke-producing composition. A quick-match wick and a length of safety fuse connects the candle with the igniter. The igniter casing contains a release pin, a spring-loaded striker and primer pressed into a plug which screws into the end of the casing.

Operation: The safetypin is removed and the release pin is withdrawn by pulling on the pull ring. The striker spring is compressed until the release pin is free of the casing and then the striker is released. It strikes the primer thus igniting the safety fuse and quick-match wick which ignites the smoke composition (after a short delay) which produces a yellow smoke.

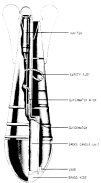


Figure 82—2-kg. Smoke Float.

Remarks: This smoke float will also be found with a black nose and white body. When so painted, it contains a black smoke unit.

43-kg. Smoke Float

Fuzes: D–3 (a) (with vane cups).
Over-all length: 51 inches.
Length of body: 35½ inches.
Diameter of body: 11¼ inches.
Material of wall: Sheet steel.
Type of suspension: Horizontal.
Suspension lug: Normal Navy suspension lug.
Color and markings: Grey over all with a ¼ inch red stripe forward of the end cap.
Length of tail fins: 15 inches.
Width of tail: 13⅛ inches.
Width of tail fins: 2¾ inches.
Dimensions of tail struts: None.

Figure 83—43-kg. Smoke Float.

Material of tail: Sheet steel.
Type of filling: Smoke composition.
Weight of filling: 42 pounds (including container).
Total weight of bomb: 94 pounds.

Description: The float consists of five sections; a weighted nose, a conical body, a boat-tailed attachment, an after piece and an end cap. All parts are soldered solidly together with the exception of the end cap which is held on by four spot solders. Four fins are soldered to the after piece and boat-tailed attachment. The fuze pocket is located in the side of the after piece and has an extended opening.

The smoke composition is contained in a tin cylinder running from the nosepiece to a steel ring in the boat-tailed attachment. A pull igniter, delay train and quick-match composition are contained within the smoke unit.

The parachute of light weight white silk is packed compactly in the after piece. The parachute is secured to a ¼ inch wire rope which is attached to a shackle on a wooden block. At the junction of the parachute shrouds and the wire rope is a chock absorber of ⅜ inch bungee rubber strands. On the opposite side of the block are two ¼ inch wire ropes which lead through a second wooden block to a steel ring at the after end of the boat-tailed attachment. Lashed securely to one of the ¼-inch cables is a 1/16-inch cable leading to a pull igniter in the smoke container. A second 1/16-inch cable leads from the shackle on the after wooden block to a small wooden disk contained in the second block. Around this is a black powder ejection charge. A third 1/16-inch cable leads from the shackle to a contact on the body at the top of the container.

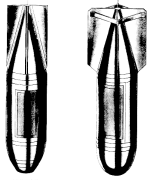
Operation: When the aerial burst fuze functions, the ejection charge is ignited. The end cap is torn off and the parachute ejected. As the parachute is blown out, the pull igniter is actuated and the delay train initiated.

The parachute checks the fall of the flare sufficiently to prevent smashing of the case on impact with the water. The smoke composition burns from 5 to 8 minutes giving off a grey-black smoke that is heavier than air.

Type 0 Model 1, Type 0 Model 2, and Cardboard Type Sea Markers

Fuzes: None.

	Type 0 Model 1	**Cardboard type**
Over-all length	12½ inches	12½ inches.
Length of body	7½ inches	7½ inches.
Diameter of body	3 inches	3 inches.
Thickness of wall	3/64 inches	1/16 inches.
Material of wall	Sheet steel	Cardboard.



CARDBOARD TYPE

TYPE O MODEL 1

Figure 84—Type 0 Model 1, Type 0 Model 2, and Cardboard Type Sea Markers.

	Type 0 Model 1	**Cardboard type**
Type of suspension	Dropped by hand.	Dropped by hand.
Suspension lug	None	None.

Color and markings: Aluminum color. Japanese inscription printed on a paper label which is glued to the body of the marker. (Instructions for operation of marker.)

	Type 0 Model 1	**Cardboard type**
Length of tail	5 inches	5 inches.
Width of tail	4¼ inches	3 inches.
Width of tail fins	1⅞ inches	1¼ inches.
Dimensions of tail struts.	2¾ x 5/16 x 1/64 inches.	None.
Material of tail	Light tin	Cardboard.

Type of filling: Aluminum powder, containing 6.5 percent zinc. 1 ounce. covers 118 square feet. No explosive.

	Type 0 Model 1	**Cardboard type**
Weight of filling	0.7 pound	1.0 pound.
Total weight of bomb	3.5 pounds	3.5 pounds.
Charge/weight ratio	20 percent	20 percent.

Construction of body: Type 0: A sheet steel cylindrical body is fastened to the steel nosepiece by four punch marks. The tail cone and body are joined by a thin disk of light wood secured by four tacks in each component.

Cardboard type: A hollow-steel nosepiece is secured to a paper body by a strip of adhesive tape. The body is reinforced by cardboard strips. A cardboard tail cone is fastened to the body by adhesive tape. Four cardboard fins are glued to the tail cone. Situated in the hollow section of the steel nosepiece is a wooden cylinder 1 7/16 inches in diameter. Fastened to this cylinder is a small wooden disk the same diameter as the inside of the body. Located between this nose disk and the wooden disk in the tail is a connecting wooden pin 4¾ inches long.

Operation: Type 0: On impact with the water, the plug in the nose is forced up into the body, forcing the tail portion to be freed from the body, thereby scattering the aluminum powder.

Cardboard Type: On impact with water the container breaks up and releases the aluminum powder.

Remarks: Type 0 Model 2 is similar in construction to Model 1. It is painted yellow over all and contains a filling of dark green powder which produces a green slick on the water.

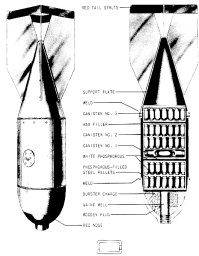


Figure 85—Type 3 No. 6 Target Marker Bomb.

Type 3 No. 6 Target Marker Bomb

Fuzes: A–1 or A–3 series.
Over-all length: 42¼ inches.
Length of body: 21 inches.
Diameter of body: 9½ inches.
Thickness of wall: ⅛ inch.
Material of wall: Steel.
Type of suspension: Horizontal.
Suspension lug: Normal suspension lug.
Color and markings: The bomb is grey over all with a red band on the nose and red tail struts. Four longitudinal grooves are painted red.
Length of tail: 21¼ inches.
Width of tail: 13¼ inches.
Width of tail fins: 6 inches.
Dimensions of tail struts: Length, 9¼ inches; width, 1½ inches; thickness, 3/16 inch.
Material of tail: Steel.
Type of filling: The filling consists of 152 phosphorous-filled steel pellets contained in three cylindrical steel canisters. Each canister is filled with pellets and the space not occupied by the pellets is filled with white phosphorus. The canisters are covered with a heavy wax coating. There is a charge of type 98 explosive in the nosepiece of the bomb.

Weight of canisters:
68 pellets: 56.0 pounds.
56 pellets: 37.5 pounds.
28 pellets: 13.0 pounds.

Dimensions of canisters:	Length	Diameter
68 pellets	7 inches	8¼ inches.
56 pellets	5¾ inches	8¼ inches.
28 pellets	3 inches	8¼ inches.
Dimensions of pellets	2½ inches	1½ inches.

Weight of filling: 107 pounds.
Total weight of bomb: 155 pounds.
Charge/weight ratio: 69 percent.

Construction of body: A cast-steel nosepiece is attached to a longitudinally welded steel body by a continuous weld. The nosepiece contains a gaine well surrounded by an explosive charge which in turn is surrounded by a wooden filler plug. The body has 4 external longitudinal grooves 90° removed from each other. The tail cone is welded to a collar which fits into the body and is held there by a single row of 16 screws.

Construction of tail: The tail cone is constructed of ⅛-inch steel and is welded longitudinally. Four steel fins are welded to the cone and are braced by a single set of box-type struts.

Type 2 2-kg. Target Indicator

Fuzes: None.
Over-all length: 17 inches.
Length of body: 11 3/16 inches.
Diameter of body: 3 inches.
Thickness of wall: 3/16 inch.
Material of wall: Bakelite.
Type of suspension: Horizontal.
Suspension lug: A steel suspension ring is attached to a steel band by a soldered tin strip. The steel band fits tightly around the bomb body.
Color and markings: Black body and tail. No other color or markings present.
Length of tail: 4⅜ inches.
Width of tail: 5 inches.
Width of tail fins: 1 3/16 inches.
Dimensions of tail struts: Length 3⅛ inches; width 7/16 inch.
Material of tail: Sheet tin.
Type of filling: F. M. (titanium tetrachloride).
Weight of filling: 1 pound 7¾ ounces
Total weight of bomb: 3 pounds 14 ounces.
Charge/weight ratio: 37 percent.

Construction of body: The bomb body is of molded bakelite construction with an opening in the after end only. This opening is threaded to receive a bakelite stopper, the union being sealed by a black rubber washer. The stopper is threaded internally to receive a bakelite tube which extends nearly the complete length of the bomb body. The after end of the stopper is a slightly tapered tube and a rubber tube is cemented over it. Cemented into the after end of the rubber tube is a glass tube through which the bomb is filled. When the bomb is approximately two-thirds filled with liquid F. M. the glass tube is heated and sealed off. A small wire is attached to the glass tube at the point of sealing. Each of the cemented unions is reinforced with a wire wrapping.

A ballistic cap is glued to the nose of the bomb. The cap is made of heavy paper and is filled with fine iron filings to make the bomb nose heavy.

Construction of tail: The tail fins are made of sheet tin. Pairs of adjacent fins are stamped from the same piece of metal and soldered to the forward end after circular struts. The edges of the fins are strengthened by having a one-eighth (⅛) inch turn-back. The after circular strut (width, 1 inch; diameter, 1⅞ inches) is similarly

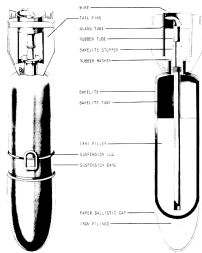


Figure 86—Type 2 2-kg. Target Indicator.

strengthened. The forward circular strut (width, 9/16 inch; diameter, 1 1/16 inches) is of lighter gage tin and is secured to the fins by soldering except for one free end which is secured by a bolt and nut after the fins are assembled to the bomb. To insure positive seating of the fins, a rubber insert extends half way around the inside of the forward circular strut. A single set of box-type struts (length, 3 1/8 inches; width, 7/8 inch) is located at the after extremities of the fins.

Operation: The bomb is released from the plane and the case fractures on contact with the target. The smoke mixture is dispersed.

2-kg. Window Bomb

Fuzes: Pull igniter.
Over-all length: 37 inches.
Length of body: 37 inches.
Diameter of body: 1¾ inches.
Thickness of wall: 1/32 inch.
Material of wall: Sheet steel.
Type of suspension: None, hand thrown.
Suspension lug: None.
Color and markings: Grey over all. Two yellow labels. One gives instructions for use, the other the following: Silver paper scattering bomb, manufactured October 1944, Navy Air Force Arsenal.
Length of tail: 12 inches.
Width of tail: 2⅞ inches.
Width of tail fins: 5/16 inch

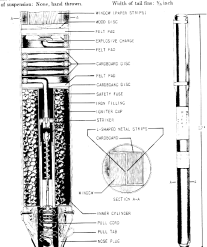


Figure 87—2-kg. Window Bomb.

Dimensions of tail struts: Length, 2 inches; width, ⅜ inch; thickness, 1/32 inch.

Material of tail: Sheet steel.

Type of filling: 250 paper strips, cylinder containing iron pyrite.

Weight of filling: Paper strips, 10 ounces; iron pyrite and cylinder, 20 ounces.

Total weight of bomb: 4 pounds 7 ounces.

Description: Bomb consists of a nosepiece, body and end cap. Nosepiece is made of wood and has a hole in the center to accommodate the string attached to the pull igniter. End of nosepiece is sealed with a paper disk which is removed when the bomb is to be used. Nosepiece is secured to body by six nails. Body is of light sheet metal construction, soldered longitudinally. After end is closed by an end cap of similar metal and held in place by a sealing tape.

Four equally spaced tail fins are soldered to the body, 1 inch from the after end of the case. Two sets of tail struts are utilized to support the fins.

Filling of the bomb case consists of 250 metal coated paper strips and an inner cylinder which contains the delay element and ejection charge. Inner cylinder is in the front end of the case. It is of light sheet metal construction and soldered longitudinally. A metal disk closes the nose end and another metal disk is soldered in place 1⅝ inches from the tail end. Space between the two disks is filled with iron pyrite to make the bomb nose heavy. Each disk has a ½-inch hole in the center through which a metal tube is inserted. This houses a standard type pull igniter such as is used in the 5-kilogram parachute flare. An 11 inch length of safety fuse crimped into the after end of the igniter is led to an annular bag containing smokeless powder.

The 250 paper strips are just aft of the inner cylinder. Two L-shaped metal strips placed back to back hold 125 strips each. Four heavy cardboard strips surround the paper strips to insure their smooth ejection. The paper strips are covered on one side only by a metal foil.

Operation: The cotton tab on the nose is pulled exposing the pull igniter cord. This cord is pulled and the striker hits a flash cap which ignites the safety fuse. The bomb is thrown from the plane. The safety fuze burns for 40 seconds and sets off the smokeless powder which ejects the paper strips.

"Baka" Piloted Rocket Bomb

BOMB DATA

Over-all length: 19 feet 10 inches.

Wingspread: 16 feet 5 inches.

Description: The "Baka" bomb is a suicide weapon designed to be controlled by a human pilot. It is carried beneath the fuselage of a bomber and released near its target. Three rocket motors provide propulsion after release from the mother plane. The entire explosive content of the Baka bomb is contained in the warhead in the nose.

WARHEAD DATA

Fuzes: A–3 (g), B–9 (a), B–10 (a), two of each.

Over-all length: 68½ inches.

Diameter: 23½ inches.

Thickness of wall: 1¼ inches.

Material of wall: Steel.

Suspension: The war head is secured to the fuselage of the "Baka" bomb by four brackets welded to the base plate.

Color and markings: Grey over all. Green band around nose, a brown band adjacent to it.

Type of filling: Trinitroanisol.

Weight of filling: 1,135 pounds.

Total weight of warhead: 2,645 pounds.

Description: The warhead is of one piece, machined steel construction. It has parallel sides and an ogival nose. The nose fuze pocket is 8½ inches deep. The after end of the warhead is

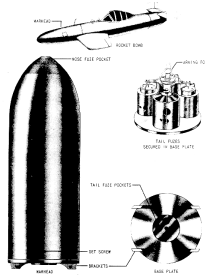


Figure 88—"Baka" Piloted Rocket Bomb.

closed by a base plate. Four tail fuze pockets are grouped around a central threaded hole in a slightly raised portion of the base plate. The center hole accommodates an arming device which the pilot operates to arm the four tail fuzes simultaneously.

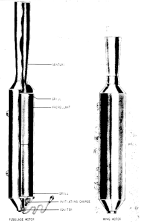


Figure 89—Type 4 Mk 1 Launching Rocket ("Baka" Motors).

Type 4 Mk 1 Launching Rocket ("Baka" Motors)

	Wing	Fuselage
Over-all length	65⅛ inches	78 inches.
Maximum diameter	10⅛ inches	10⅛ inches.

Description: Three fuselage motors contained in the after portion of the Baka serve as the main propulsion units. Two wing motors differing only in method of suspension and having shorter venturi tubes may or may not be used in addition to the fuselage motors.

	Wing	Fuselage
Weight of complete motor.		266 pounds.
Weight of propellant	97.8 pounds	97 8 pounds (44.8 kg.).
Length of propellant stick.	19⅜ inches	19⅜ inches.
Depth of propellant stick.	4⅜ inches.	4⅜ inches.
Weight of ignition charge.	120 grams	120 grams.

Propellant: The propellant consists of 6 sticks of 500 special D. T. (code designation). Chemical analysis of this propellant is: 59.9 percent nitrocellulose, 26.9 percent nitroglycerine, 6.1 percent mononitronaphthalene, 2.9 percent ethyl centralite and 1.3 percent volatiles.

Ignition: The motors are ignited by electrically fired squibbs fitted into the nose portion of the motor. The firing circuit is controlled by a selector switch in the cockpit.

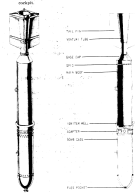


Figure 90—Special Mk 1 Rocket Motor Model 21.

Special Mk 1 Rocket Motor Model 21

Overall length: 80.3 inches.

Maximum diameter: 11.8 inches (300 millimeters).

Description: This unit is designed as an integral type bomb pusher for launching 250-kilogram bombs from ground launchers for land bombardment. The motor described here is specifically designed to fit type 98 No. 25 land use bombs. Another motor is reported to be designed as a pusher unit for type 99 No. 25 ordinary bombs. This motor has never been recovered but is reported to be only slightly different from the recovered model.

Weight of complete motor: 429.2 pounds (194.8 kilograms).

Weight of propellant: 178.2 pounds (81 kilograms).

Length of propellant stick: 21.65 inches.

Depth of propellant stick: 3⁵⁄₁₆ inches (39.3 millimeters).

Weight of ignition charge: 150 grams.

Propellant: The propellant charge consists of 20 sticks of 343 special D. T.$_{2}$ (code designation). The chemical analysis is not known as the motor has never been recovered complete. The 20 sticks are arranged in 2 groups of 10 sticks each, 1 group directly aft of the other.

Igniter: The igniter consists of an igniter body, electric cap and igniter charge of black powder. The igniter is inserted in the forward end of the motor and is ignited by a hand generator.

Launcher: A crude wooden trough mounted on a bipod forward and a steel base plate aft.

Remarks: The 250-kilogram bomb pusher unit unlike the 60-kilogram units remain with the explosive head throughout flight.

Type 3 and Model 10 Bomb Launching Devices

	Type 3	Model 10
Over-all length	40⅛ inches	33 inches.
Maximum diameter	7⅞ inches (20 centimeters).	7⅞ inches (20 centimeters).

Description: Both motors are designed as propulsion units for 60 -kilogram ordinary or land use bombs. The motors are used to propel these bombs from crude V-shaped wooden troughs for land bombardment. The motors are interchangeable and may be used on either the 60-kilogram ordinary or land use bomb.

	Type 3	Model 10
Weight of complete round.	92 pounds (42 kilograms).	52 pounds (23.6 kilograms).
Weight of propellant.	25 pounds (11 kilograms).	13 pounds (5.9 kilograms).
Length of propellant stick.	18⅛ inches	10¼ inches.
Depth of propellant stick.	3⁵⁄₁₆ inches	3⁵⁄₁₆ inches.
Weight of ignition charge.	2 ounces	2 ounces.

Propellant: The propellant charge consists of three sticks of 343 D. T.$_{3}$ and 343 apecial D. T.$_{3}$ (code designation) for the Model 10 and type 3, respectively. The chemical analysis of 343 D. T.$_{3}$ is 65 percent nitrocellulose, 30 percent nitroglycerine, 3.0 percent ethyl centralite and 2.0 percent sodium chloride. The chemical analysis of 343 special D. T.$_{2}$ is not known but probably involves a small variation of 343 D. T.$_{3}$. The complete Japanese designation for 343 D. T.$_{2}$ is type 93 Mk 2 propellant.

Ignition: The propellant is ignited by an electrical squib. Current is supplied by a hand generator.

Launcher: A crude V-shaped wooden trough mounted on a bipod forward and a steel base plate aft. The angle of elevation can be varied.

Remarks: The variation in the size of the two motors is possibly a means of varying the range.

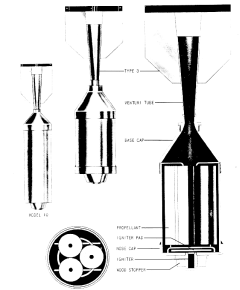


Figure 91—Type 3 and Model 10 Bomb-Launching Devices.

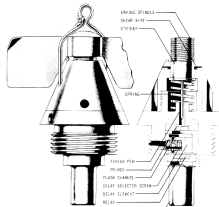


Figure 92—A-2 (a) Bomb Fuze.

Chapter 2

JAPANESE BOMB FUZES

Introduction

The Japanese Army Air Force and the Japanese Navy Air Force each use a distinctive set of fuzes. Therefore, this section is divided into two main parts, Army and Navy.

Individual fuzes and gaines of each service are generally interchangeable for use in bombs of that service but are not interchangeable for use in ordnance of the other.

Each group possesses certain definite identifying characteristics:

ARMY FUZES

1. Arming vanes have holes for arming wires.
2. Safety forks are usually fitted over the vanes into holes in the top of the fuze body.
3. Most fuzes have the primer as an integral part of the fuze.

NAVY FUZES

1. Arming vanes do not have holes for arming wires.
2. Safety forks or safety pins are usually inserted into the fuze body from the side.
3. The fuze seldom has the primer as an integral part of the fuze.

Designation: At the beginning of the war little was known about the Japanese designations for their fuzes. The Allies developed a system of nomenclature consisting of three parts, (1) a capital letter, (2) a numeral, (3) a small parenthetical letter.

1. The capital letter denotes the basic type of fuze:

A	Nose impact fuze.
B	Tail impact fuze.
C	Long delay fuze (nose or tail).
D	Aerial burst fuze (nose or tail).
E	Protective fuze (nose or tail).

2. The numeral indicates the approximate order of recovery by the Allied forces of different basic designs of fuzes within the general classification of A, B, C, D, or E.

3. The small letter in parentheses indicates whether the fuze is the first, second, etc. example of a basic design. The difference between A–2 (a) and A–2 (b) is roughly equivalent to the difference between modifications of a certain mark of U. S. Navy ordnance.

The Allied system of designations makes no distinction between Japanese Army and Japanese Navy fuzes.

Wherever possible, the Japanese designation and Allied designation appear in the title. If no Japanese designation is given it indicates that the Japanese had no separate designation for this fuze.

Chapter 2—Section 1

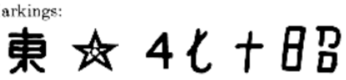
ARMY BOMB FUZES

Type 93 Instantaneous—Short-Delay Fuze A–2 (a)

Bombs in which used:

Type 94 50 and 100-kg.
Type 94 50 and 100-kg. (special).
Type 3 50 and 100-kg.
Type 1 and 2 30-kg. substitute.

Markings:



(Tokio—April 1942)

Color: Natural brass.
Over-all length: 2¾ inches.

Over-all width: $1\frac{23}{32}$ inches.

Material of construction: Brass except steel spring and steel firing pin.

Position and method of fixing in bomb: Nose fuze screwed in by hand and tightened by spanner wrench.

Components of explosive train: Primer flash cap ignites a short delay train, or passes through the selector to give instantaneous action by igniting a relay which sets off the gaine.

Fuzes likely to be found with:
    B–1(a) tail fuze.

Delay times:
    Short delay time (unknown).

Threads:
    $1\frac{5}{32}$ inch diameter 13 threads per inch.

Description: The upper body portion houses the striker and arming spindle while the lower body portion contains the selector mechanism for instantaneous or short delay. A shear wire and spring hold the arming spindle after the vanes fall away. A U-shaped safety wire fits over the vanes into the holes. A selector screw is fitted in the fuze body and cannot be changed while the fuze is fitted within the bomb. A stop stud on the body and one on the vane cap prevent the arming vane assembly from jamming too tightly. The Regular Army gaine is fitted to the fuze.

Operation: The arming wire is withdrawn from the vanes upon release of the bomb and after 10 revolutions, the vanes fall free. On impact, the wire is sheared and the striker is forced inward against the action of the spring. If the selector switch is set for instantaneous action the flash from the primer passes directly through the open channel to fire a relay which fires the gaine. If the switch is set for delay action, the flash channel is closed and the primer ignites the delay element which in turn fires the relay and the gaine.

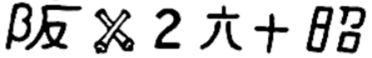
Remarks: If the fuze is found with the arming spindle depressed, the striker is probably imbedded in the primer and a slight movement may free it, and the spring will force the striker back. This friction may be sufficient to set off the primer, thereby igniting the exploder system. Could be used in 15-kilogram antipersonnel, 50-kilogram incendiary, and 50-kilogram gas bombs.

A–2 (a) has been found with a short black power gaine extending only $\frac{13}{32}$ inch below the fuze body.

Type 12-Year Instantaneous Fuze A–2 (b)

Bombs in which used:
    Type 94 15-kg. substitute.
    Type 100 50-kg. incendiary.
    Type 97 50-kg. gas.

Markings:



Osaka—February 1941

Color: Natural brass.

Over-all length: 2¼ inches (with vanes), (less gaine).

Over-all width: $1\frac{11}{16}$ inches.

Material of construction: Brass except steel spring and steel firing pin.

Position and method of fixing in bomb: The fuze is screwed into the nose of the bomb and tightened with a spanner wrench. A grub screw is usually present in the nose also.

Components of explosive train: This fuze has an Army gaine with the primer in the gaine. The striker enters the gaine, pierces the primer and sets off the exploder assembly.

Fuzes likely to be found with: Probably none; may be fitted to bomb with an Army tail fuze.

Delay times: None.

Threads: $1\frac{5}{32}$ inches diameter, 13 threads per inch.

Description: The fuze body houses the striker and the arming spindle. Vanes are screwed onto the arming spindle which projects above the body. No shear wire is used. After arming, the striker is kept away from the gaine by means of a spring. A U-shaped wire secures the vanes during transit, and it is removed only after the fuze is in the plane. A stop stud is found on the body and on the vane cap, and these prevent the vanes from being jammed against the fuze body.

Operation: Upon release from the plane, an arming wire is withdrawn from the holes in the vanes and the latter rotate and fall free. Upon

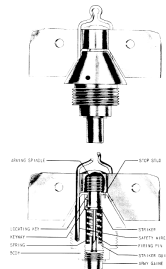


Figure 93—A-2 (b) Bomb Fuze.

impact with the ground, the striker is pushed in against the action of the spring and the firing pin pierces the primer which is located in the gaine.

Remarks: Fuze generally used in bombs requiring detonation at ground level such as incendiary, antipersonnel, and gas.

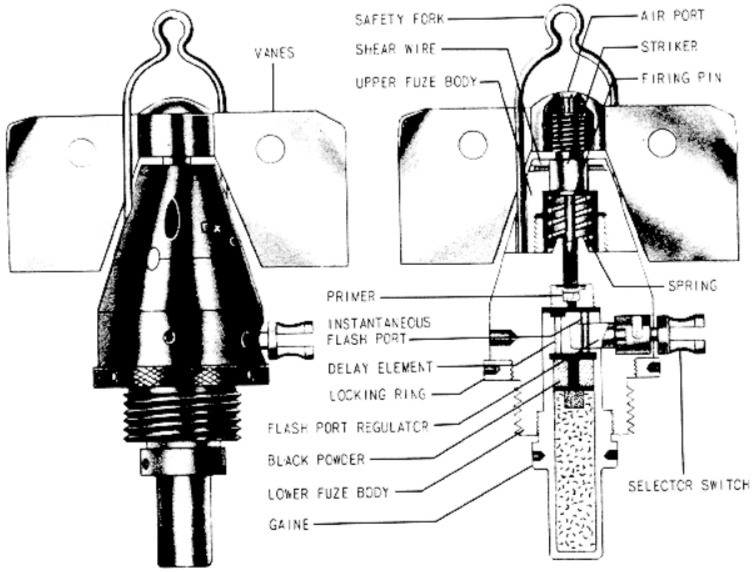
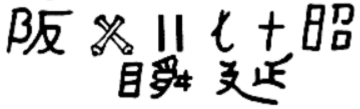


Figure 94—A-2 (c) Bomb Fuze.

Type 99 Instantaneous-Short Delay Fuze
A-2 (c)

Bombs in which used:
- Type 94 50- and 100-kg.
- Type 94 50- and 100-kg. (special).
- Type 3 50- and 100-kg.
- Type 1 and 2 20-kg. substitute.

Markings:



Osaka—November 1942

Instantaneous Delayed

Color: Natural brass coated with a yellowish green varnish. Fuze may be steel colored.

Over-all length: $3\frac{3}{4}$ inches (less gaine).

Over-all width: $1\frac{19}{32}$ inches.

Material of construction: Brass throughout except for steel firing pin, steel spring and copper shear wire.

Position and method of fixing in bomb: Screwed clockwise into nose and locking ring tightened. Both fuze body and locking ring contain spanner wrench holes.

Components of explosive train: Detonator cap, a selective pyrotechnic assembly, and a gaine.

Fuzes likely to be found with: B–1 (a), B–1 (b).

Delay times: Instantaneous or short delay.

Threads: $1\frac{9}{32}$ inches in diameter, 13 threads per inch.

Description: The upper fuze body houses the striker and the firing pin while the lower body portion contains the selective delay assembly. A U-shaped safety wire fits over the arming vanes into holes in the upper fuze body to prevent premature rotation. The shear wire and spring prevent the firing pin and striker from moving down on the primer after the fuze is armed. The selective delay assembly consists of one channel containing a pyrotechnic train for short delay, an open flash channel for instantaneous action, and a selector switch. Choice of fuze action is made by turning the switch to the vertical or horizontal position in accordance with the Japanese characters and red arrow indicating the setting. A stop stud on the upper fuze body and one on the vane cap prevent the arming vane assembly from jamming too tightly. An Army gaine is threaded into the lower body.

Operation: The arming wire is withdrawn upon release of the bomb and after 10 revolutions, the vanes fall free. On impact, the wire is sheared and the striker is forced inward against the spring. If the selector switch is set for instantaneous action, the flash from the primer passes directly through the open channel to fire a relay which fires the gaine. If the switch is set for delay action, the flash channel is closed and the primer ignites the pyrotechnic delay element which in turn fires the relay and the gaine.

Remarks: Fuze armed after 6 rotations of vane; vanes will fall off after 10 rotations.

Variations of this fuze have been recovered. They are identical with the brass-bodied A-2 (c) except that the upper fuze body and in some cases, the entire fuze body is made of steel.

Crashed Aircraft Intelligence (India) has found a fuze changing mechanism with each bomb-release mechanism on Army bombers. Operation of the "fuze changer" causes a projecting telescopic arm to rotate approximately 90°. The forked end of this arm will fit into slot of selector switch.

Type 1 Instantaneous Fuze A-2 (d)

Bombs in which used:
  Type 92 15-kg.
  Type 100 50-kg. incendiary.
  Type 100 50-kg. gas.
Color: Natural brass.
Over-all length: 2 inches.
Over-all width: $1\frac{5}{16}$ inches; vane span $3\frac{3}{8}$ inches.
Material of construction: Brass except for light metal striker-primer assembly.
Position and method of fixing in bomb: The fuze is screwed into the nose fuze pocket and is usually secured in place by a grub screw.
Components of explosive train: The primer is housed in the fuze body. The remainder of the explosive train is contained in the gaine.
Fuzes likely to be found with: Probably none; however, it may be used in bombs that can be fitted with a tail fuze.
Delay times: None.
Threads: $1\frac{5}{32}$ inch diameter, 13 threads per inch, RH.

Description: The fuze body is of one piece brass construction. The upper portion of the body is threaded externally to receive the arming vanes. The lower portion is threaded internally to accommodate an Army type gaine and threaded externally to fit a fuze pocket.

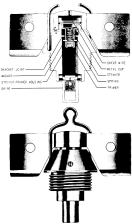


Figure 95—A-2 (d) Bomb Fuze.

The fuze body contains the striker-primer assembly. This consists of a light metal striker-primer housing, striker, primer, spring, light metal cup, washer, and copper shear wire. The striker is secured to a disk which rests on the shoulder of the tubular striker-primer housing. The metal cup fits inside of the housing and its edges bear against the striker disk. The copper shear wire holds the entire assembly in position. The primer is in the base of the housing and is held there by a winged washer which fits into the slots in the side of the housing. A spring separates the washer and the striker disk.

A bayonet joint on the inside of the fuze body accommodates the wings of the washer in assembling the fuze. After being inserted, the striker-primer housing is rotated 90° before it is secured in place.

Operation: When the bomb is released from the plane the arming wire is withdrawn, the vanes rotate and fall free. Upon impact with a solid object the copper wire is sheared and the striker-primer assembly moves down and bears against the bayonet joint. At the same time inertia causes the primer and washer to move forward

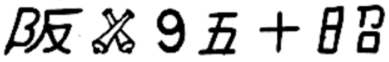
against the spring, the primer hits the striker and is fired.

Remarks: The striker-primer assembly in this fuze is an exact copy of the Remondy mechanism used in French fuzes.

Type 92 Nose Fuze For Large Bombs A–4 (a)

Bombs in which used: Type 92 or type 3 250-kg.

Markings:



(Osaka—September 1940)

Color: Natural brass.

Over-all length: 7 3/32 inches (less booster).

Over-all width: 2 13/32 inches.

Material of construction: Brass except steel spring and steel firing pin.

Position and method of fixing in bomb: The fuze is screwed into the nose of the bomb and tightened with a spanner wrench.

Components of explosive train: A primer sets off a delay element which fires a gaine which in turn sets off the booster.

Fuzes likely to be found with: Probably B–4 (a).

Delay times: Not known (short delay only).

Threads: 1⅝ inches diameter, 8 threads per inch.

Description: The upper portion of the fuze body houses the arming vane assembly. The lower portion of the fuze body houses the firing pin which is attached to a plug, and the two safety plungers which protrude beyond the point of the firing pin. The vanes are riveted to a sleeve which is screwed to the arming spindle. The vanes are free to rotate, but two grub screws prevent their falling off. A spring keeps the firing pin away from the primer, after the fuze is armed, until impact with the target. A selector unit permits a delay to be set. The standard Army gaine is surrounded by a booster. Spanner holes are present. A U-shaped safety wire is also probably used.

Operation: Upon release from the plane, an arming wire is withdrawn from the holes in the vanes and the vanes rotate, but do not fall free. The arming spindle is screwed upward by the vanes, raising the two safety plungers with it. This allows the firing pin point to protrude below the plungers. On impact, the primer carrier moves against the spring and hits the firing pin to set off the firing train.

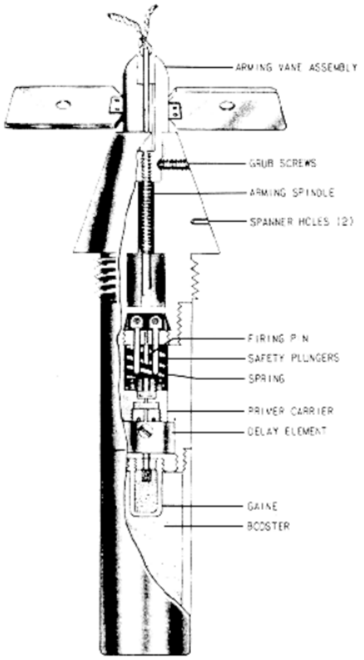


Figure 96—A–4(a) Bomb Fuze.

Fuze for Type 3 Bomb A–6 (a)

Bombs in which used: Type 3 ½-kg.

Color: Natural brass.

Over-all length: 1 7/16 inches.

Over-all width: 1 inch.

Material of construction: Brass except steel spring and striker and copper shear wire and nose cap.

Position and method of fixing in bomb: Screwed into nose. Secured by a grub screw.

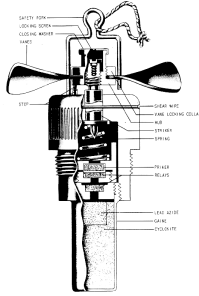


Figure 97—A-6 (a) Bomb Fuze.

Components of explosive train: Primer flash cap, two relay pellets of black powder, cyclonite booster with lead azide detonator.

Fuzes likely to be found with: None.

Delay times: Instantaneous.

Threads: 1 3/16 inches in diameter. 16 threads per inch.

Description: The steel striker is held in the brass body by a soft copper shear wire. A spring is positioned between the striker and the movable primer carrier. The vane hub screws down on the portion of the striker that extends above the fuze body. A locking screw in the top of the striker prevents the vane assembly from falling away.

Operation: The vanes rotate, screwing the vane assembly to the top of the striker where it is stopped by the locking screw head. The fuze is now armed. On impact the shear wire is broken and the striker is driven inward. Simultaneously, the movable primer carrier moves forward against the spring until the firing pin pierces the primer.

Remarks: The fuze is armed after 4½ turns of the vanes.

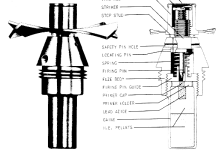


Figure 98—A-6 (b) Bomb Fuze.

Fuze For Type 3 Bomb A-6 (b)

Bombs in which used: Type 3 ½-kg.

Markings:

東 ☆ 2 四十昭

(Tokyo Army Arsenal, February 1939)

Color: Natural brass.

Over-all length: 1⅝ inches (less gaine).

Over-all width: ⅞ inch.

Material of construction: Brass except for a steel spring, a key and two stop pins.

Position and method of fixing in bomb: Screwed into the nose. Secured by a grub screw.

Components of explosive train: The entire explosive train is contained in the gaine. The primer screws into the gaine and is adjacent to the lead azide core. Two high-explosive pellets fill the gaine.

Fuzes likely to be found with: None.

Delay times: Instantaneous.

Description: The brass fuze body contains the firing pin, striker block, and spring. A locating pin set in the fuze body fits into a keyway in the striker preventing it from rotating. A firing pin guide is screwed into the base of the fuze body. A vane hub screws down on the portion of the striker that extends above the fuze body. The locking screw in the top of the striker prevents the vane assembly from falling away. The top of the vane hub is sealed by a closing washer which is crimped over its end.

Stop studs on the vane hub and on the fuze body, prevent the vanes from binding.

A safetypin hole extends through the fuze body and striker but no safetypin has been recovered.

There is no shear wire in this fuze.

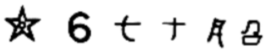
Operation: When the bombs fall free from the container the vanes on the fuze rotate and thread out to the locking screw. On impact the striker compresses the spring and hits the primer.

Remarks: The fuze is armed after four turns of the vanes.

Fuze For Type 2 Bomb A–7 (a)

Bombs in which used: Type 2 $\frac{1}{2}$-kilogram bomb.

Markings:



(Tokyo Army Arsenal June 1942)

Color: Aluminum.

Over-all length: $1\frac{5}{16}$ inches (less gaine).

Over-all width: $1\frac{3}{4}$ inches.

Material of construction: Aluminum body and arming vane, brass arming spindle, striker and primer carrier. Firing pin is steel.

Position and method of fixing in bomb: Threads into an adapter on the bomb body, tightened with a spanner wrench.

Components of explosive train: Primer and gaine. Gaine incorporates a black powder relay.

Fuzes likely to be found with: None.

Delay times: None.

Threads: 32 threads per inch; RH, diameter, $1\frac{1}{8}$ inches.

Description: The fuze body is of one-piece construction. It is closed at the forward end by a threaded closing disk. The after end is threaded externally to screw into the bomb and internally to receive the gaine. The base of the body is pierced centrally by a flash hole.

A single arming vane is held in the safe position against the fuze body by a safety pin which fits through a brass nub protruding from the fuze body. The arming vane is hinged to a brass arming spindle. The spindle threads through the fuze body and extends through the striker body.

The all-ways action unit is housed within the fuze body, the cavity of which is tapered so that the diameter at the base is smaller than at the nose. The outer ends of the striker and primer carrier assembly are domed. The striker body is of solid brass construction with a sharp steel firing pin in the base. A hole is drilled through the body to receive the arming spindle. The primer carrier is made of brass and consists of a barrel threaded at one end to receive a male base plug containing the primer. In the outer diameter of the plug are drilled four flash holes. The inner diameter of the barrel is large enough to accommodate the striker body. A light spring holds the two apart.

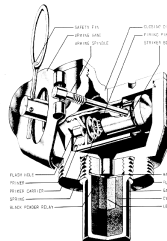


Figure 99—A-7 (a) Bomb Fuze.

Operation: The safety pin is withdrawn from the arming vane before the bomb is thrown from the plane. The vane rotates causing the arming spindle to thread out of the fuze body and fall free. On impact with a solid object, the striker and primer are cammed together overcoming the force of the spring. The flash from the primer passes through the flash holes, ignites the relay which in turn sets off the gaine.

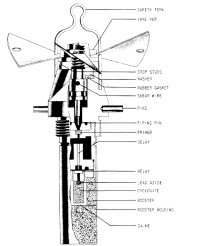


Figure 100—A–8 (a) Bomb Fuze.

Type 4 Two-Second Delay Fuze A–8 (a)

Bombs in which used: Type 3 100-kg. skipping model bomb.

Color: Brass, except for black vanes.

Overall length: 3½ inches (less booster and gaine).

Overall width: 1½ inches.

Material of construction: Brass except for steel arming vanes, tightening pins and firing pin. Tinned sheet steel booster housing.

Position and method of fixing in bomb: Screwed into nose of bomb and tightened by a wrench that fits over the protruding pins.

Components of explosive train: Primer, delay, gaine, and booster. Relay incorporated in gaine.

Fuzes likely to be found with: B–8 (a).
Delay times: 2 seconds.
Threads: 13 threads per inch; RH, diameter 1$\frac{5}{32}$ inches.

Description: The fuze body houses a spindle that has a firing pin at its lower end, and a threaded segment at the upper end that protrudes above the body. The vane assembly consisting of four black vanes attached to a brass hub screws onto this threaded portion. The central segment of the spindle is enlarged to form a shoulder for a rubber gasket located in a recess in the top of the fuze body. A brass washer threads into this hole and bears on the top of the gasket. The spindle is drilled to receive a brass shear wire 2.5 millimeters in diameter.

The primer is contained in a thin cylinder pressed into the lower fuze body against a dividing section. The section is pierced with a flash hole.

The delay element, consisting of a column of pressed brown powder, is carried in a brass piece which threads into the base of fuze body and aligns with the flash hole in the base of the dividing section.

The gaine threads into the base of the fuze immediately below the delay element. It has a relay pellet above a lead azide cone imbedded in cyclonite.

The booster, containing two cyclonite pellets, is housed in a light metal cylinder which is crimped onto a groove in the lower part of the fuze body just below the threads.

Operation: The safety fork is withdrawn allowing the vanes to rotate up the threaded spindle and fall clear. On impact with a solid target the shear wire is sheared and the firing pin is driven into the primer. The flash ignites the delay train which in turn fires the gaine.

Type 4 Two-Second Delay Fuze For Large Bombs A–8 (b)

Bombs in which used:
  Type 3 250-kg. "Skipping Model" bomb.
  Type 3 500-kg. "Skipping Model" bomb.
Color: Brass, except for black vanes.
Over-all length: 6 inches (less booster and gaine).
Over-all width: 2⅜ inches.
Material of construction: Brass except for steel arming vanes tightening pins and firing pin.

Position and method of fixing in bomb: Screwed into nose of bomb and tightened by a wrench that fits over the protruding pins.
Components of Explosive Train: Primer, delay, gaine, and booster. Relay incorporated in gaine.
Fuzes likely to be found with: B–8 (a).
Delay times: 2 seconds.
Threads: 8 threads per inch, RH, diameter 1⅝ inches.

Description: The upper fuze body houses a striker spindle that has a firing pin at its lower end and a threaded segment at the upper end that protrudes above the body. The vane assembly consisting of four black vanes attached to a brass hub screws onto this threaded portion. Just below this threaded portion, a part of the spindle is enlarged. A rubber gasket fits down over this shoulder and a threaded washer screws down in a hole in the top of the fuze body and bears on the gasket. The spindle is drilled to receive a brass shear wire 2.5 millimeters in diameter.

The lower fuze body houses a threaded plug containing the primer and below that a threaded delay carrier. The delay train runs across the diameter of the carrier and relays on the top and bottom of the carrier serve to lead the flash away from and back to the center line of the fuze. The gaine abuts against the delay carrier. The booster housed in a brass cylinder threads onto the lower fuze body.

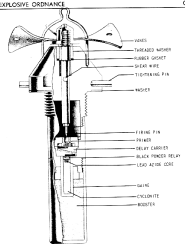


Figure 101—A-8 (b) Bomb Fuze.

Operation: The safety fork is withdrawn allowing the vanes to rotate up the threaded spindle and fall clear. On impact with a solid target the shear wire is sheared and the firing pin is driven into the primer. The flash ignites the delay train which in turn fires the gaine.

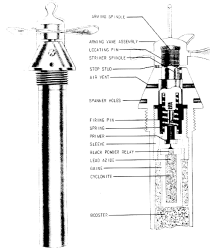


Figure 102—B–1 (a) Bomb Fuze.

Type 12-Year Tail Fuze B–1 (a)

Bombs in which used:

- Type 94 50- and 100-kg.
- Type 94 50- and 100-kg. (special).
- Type 3 50- and 100-kg.
- Type 1 and 2 30-kg. (substitute).

Markings:

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(Tokyo, December 1941)

Color: Natural brass.

Over-all length: $2\frac{27}{32}$ inches (less booster).

Over-all width: $1\frac{9}{16}$ inches.

Material of construction: Brass, except steel spring and firing pin.
Position and method of fixing in bomb: Fuze is screwed into tail of bomb and tightened with a spanner wrench.
Components of explosive train: Primer, standard Japanese Army tail gaine and booster.
Fuzes likely to be found with: A–2 (a), A–2 (c) or possibly A–2 (b).
Delay times: None.
Threads: $1\frac{5}{32}$ inches in diameter, 13 threads per inch.

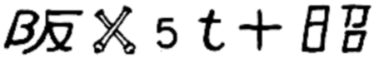
Description: The fuze body houses the arming vane assembly which is secured by a U-shaped wire. The firing pin is screwed into the striker spindle and is kept away from the primer by a spring. Six spanner holes are present, along with a hole for a shear wire. No shear wire is fitted. However, a locating pin prevents the striker spindle from rotating with the vanes. A sleeve permits the tail booster to be connected to the body. Stop studs are found on the vane cap and on the fuze body to prevent the vanes from being screwed down too tightly.

Operation: On release from the plane, an arming wire is withdrawn from the holes in the vanes, allowing the latter to rotate and fall free. On impact, the firing pin is forced inward against the action of the spring to pierce the primer and set off the exploder system.

Type 1 15-Second Delay Fuze B–1 (b)

Bombs in which used:
  Type 92 250- and 500-kg. (and special).
  Type 94 50- and 100-kg. (and special).
  Type 3 50-, 100-, 250-, 500-kg.
  Types 1 and 2 30-kg. substitute.

Markings:



(Osaka, June 1942)

Color: Natural brass.
Over-all length: $5\frac{13}{32}$ inches (less booster).
Over-all width: $1\frac{9}{16}$ inches.
Material of construction: All brass except spring and firing pin.
Position and method of fixing in bomb: Screwed into tail cone with spanner wrench fitting in holes.
Components of explosive train: Flash cap, delay train, black powder relay, standard Army gaine, and picric booster.
Fuzes likely to be found with: Will generally be used alone; however, bombs are designed to use and may have nose fuze.
Delay times: 15 to 16 seconds.
Threads: $1\frac{5}{32}$ inches in diameter, 13 threads per inch.

Description: Upper fuze body houses striker assembly, the upper end of which is threaded for the arming vanes which are prevented from rotating during shipment by a U-shaped safety fork fitting into holes. A locating pin fits into the groove in the striker spindle preventing rotation during arming time. The lower fuze body contains primer flash cap, delay train, flash channel and black powder relay. The spring prevents the striker from moving down on the primer flash cap after fuze is armed.

Operation: On release, arming wire is withdrawn allowing vanes to rotate and fall free in eleven turns. On impact, the firing pin moves in against the spring and pierces the cap. The flash passes through channel and ignites delay train, the gas from burning powder escaping through escape hole. The delay train burns around the periphery to flash channel, ignites powder relay, which in turn sets off the gaine and booster.

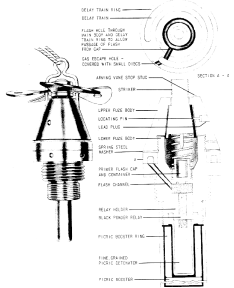


Figure 103—B-1 (b) Bomb Fuze.

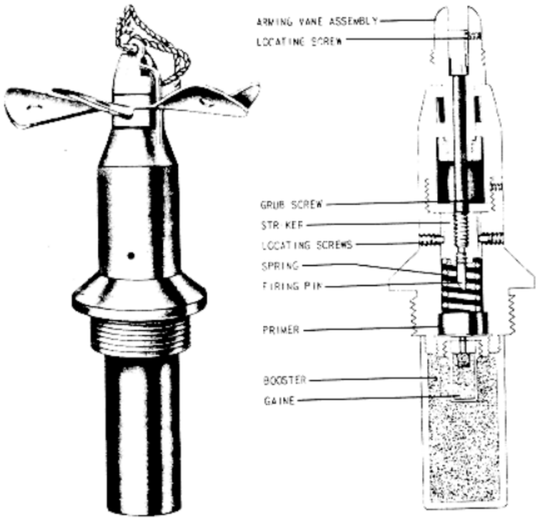
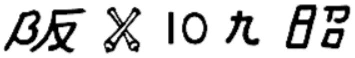


Figure 104—B–4 (a) Bomb Fuze.

Type 92 Tail Fuze For Large Bombs B–4 (a)

Bombs in which used:
- Type 3 250, 500- and 1,000-kg.
- Type 92 250- and 500-kg.
- Type 92 (special) 250- and 500-kg.

Markings:



(Osaka, October 1934)

Color: Natural brass.
Over-all length: $5\frac{29}{32}$ inches (less booster).
Over-all width: $2\frac{13}{32}$ inches.
Material of construction: Brass except steel spring and firing pin.
Position and method of fixing in bomb: The fuze is screwed into the bomb and tightened with a spanner wrench.
Components of explosive train: A primer fires the Army gaine which detonates the booster.
Fuzes likely to be found with: A–4 (a).
Delay times: None.
Threads: $1\frac{25}{32}$ inches in diameter, 8 per inch.

Description: The upper portion of the body houses the arming vane assembly. The arming spindle is threaded at the lower end to screw into the striker which is located in the lower portion of the body. A locating screw causes the spindle to rotate with the arming vanes. Two locating screws keep the striker from rotating as the spindle is unscrewed. The striker is kept away from the primer by a spring. A grub screw holds the body screwed into the lower portion. Two holes are present for the U-shaped safety wire. Six spanner holes are located in the body. The standard Army gaine is surrounded by a booster.

Operation: On release from the plane, the arming wire is withdrawn from the holes in the vanes and the latter rotate, unscrewing the spindle from the striker. The vanes will not fall free because they are held on by a locknut on the vane boss collar. On impact, the striker moves downward, and the firing pin enters the primer, overcoming the resistance of the spring.

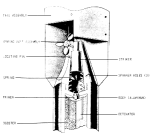


Figure 105—B-5 (a) Bomb Fuze.

B-5 (a) Tail Fuze

Bombs in which used: Type 3 ½-kg. antiaircraft.
Color: Aluminum.
Over-all length: 3⅜ inches (including tail extension).
Over-all width: 1⁵⁄₁₆ inches.
Material of construction: Aluminum.
Position and method of fixing in bomb: Tail fuze held under tail cone with vanes and arming spindle protruding perpendicular to side of bomb body.
Components of explosive train: Lead azide primer, cyclonite detonator, and TNT-cyclonite main filler.
Fuzes likely to be found with: None.
Delay times: None.

Description: The fuze body houses an inertia striker which is secured by the arming vane assembly which protrudes from the side of the body. The arming vanes are cup-shaped. A locating pin lines the hole in the striker up with the arming vane hole in the tail assembly for ease in assembly. A spring keeps the striker away from the primer flash cap after the arming vane assembly falls away. The tail assembly hides the fuze to a great extent.

Operation: The arming vane assembly unscrews and falls away after the bomb is released from the container. The spring holds the striker away from the primer while the bomb is falling. On impact, inertia causes the striker to move downward against the spring. The striker pierces the primer and the exploder system is set into operation.

Experimental 3.5 Second Delay Fuze B-7 (a)

Bombs in which used: Type 3, 100 kg. "Skipping Model" bomb.
Color: Brass, except for black vanes.
Over-all length: 4¾ inches (less gaine and booster).
Over-all width: 2⅛ inches.
Material of construction: Brass, except for steel arming vanes and steel firing pin.
Position and method of fixing in bomb: Screwed into tail fuze pocket.
Components of explosive train: Primer, delay train, gaine, and booster. Relay incorporated in gaine.
Fuzes likely to be found with: A-8 (a).
Delay times: 3.5 seconds, or an alternative setting of approximately 25 seconds.

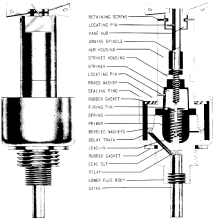


Figure 106—B-7 (a) Bomb Fuze.

Description: The fuze consists of a vane assembly, hub housing, striker housing, lower fuze body and sealing ring.

The arming vane assembly consists of three black vanes attached to a hub. The hub is retained in a cylindrical housing by two retaining pins which permit the hub to rotate. There is a locating pin on the inside of the hub which fits in a longitudinal keyway in the arming spindle. The hub housing is threaded internally at its lower end to screw onto the striker housing.

The striker housing has a threaded hole in its center. The arming spindle screws through this hole and into the striker. A locating pin on the inside of the housing fits into a longitudinal groove on the striker and prevents it from rotating. The striker is separated from the primer by a spring.

The lower fuze body contains the primer and delay train. The primer is carried in a threaded plug which screws into a hole in the center of the body. The flash lead in from the primer goes through the body to the delay train. This consists of a ring having a pressed brown powder train in a groove. The ring is a friction fit on the body and fits against a flange on the lower fuze body.

A beveled washer fitted between the delay ring and the striker housing maintains a constant tension on the ring. The delay train burns around to a lead out that goes down diagonally to a relay of black powder on top of the gaine.

The sealing ring is a large knurled brass ring. The lower fuze body fits into the ring so that its shoulder bears against a flange on the base of the ring. A rubber gasket on the outside of the ring seals this connection. The ring extends up slightly beyond the shoulder of the striker housing. A brass washer with a rubber gasket glued to it threads into the top of the ring and screws down so that the gasket bears on the shoulder of the striker housing.

Operation: Arming vanes rotate causing the arming spindle to unscrew from the striker. On impact the striker compresses the spring and hits the primer. The flash ignites the delay train which ignites the relay which in turn sets off the gaine.

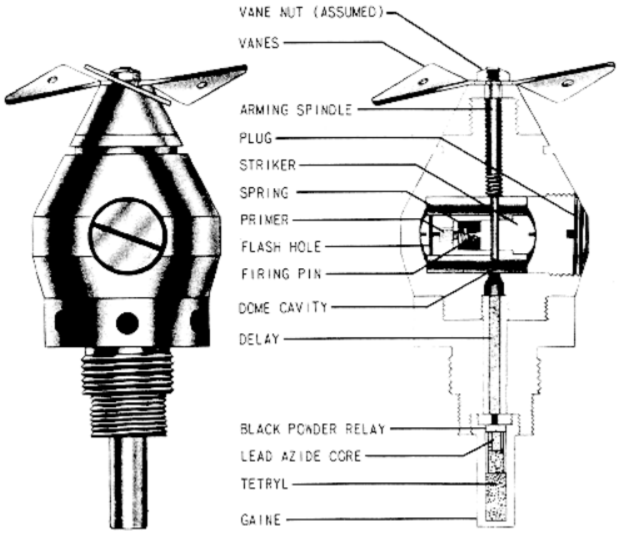


Figure 107—B–8 (a) Bomb Fuze.

Type 4 Five-Second Delay Fuze B–8 (a)

Bombs in which used: 100-kg. "Skipping Model" bomb.

Color: Brass, except for black vanes.

Over-all length: 5¼ inches (less booster).

Over-all width: 2¼ inches.

Material of construction: Brass except for steel vanes and steel striker point.

Position and method of fixing in bomb: Screws into tail cone. Tightened in place with spanner wrench.

Components of explosive train: Primer, delay train, standard Army gaine and booster.

Fuzes likely to be found with: A–8 (a).

Delay times: 5 seconds.

Threads: 13 threads per inch; RH, $1\frac{5}{32}$ inches in diameter.

Description: The fuze consists of an upper and lower fuze body. Upper fuze body houses the all-ways action unit, arming spindle and arming vane assembly. The lower fuze body which is threaded internally to receive the upper body houses the lower part of the delay element. It is threaded externally at one point to screw into the fuze pocket and below that to accommodate the booster tube. It is threaded internally at the after end to receive a standard Army gaine.

Upper fuze body is pierced centrally by a threaded hole which houses the arming spindle. Three bladed arming vanes fit over the top of the spindle and are held there by a vane nut staked in place. Just above the dome cavity is a threaded segment of the arming spindle. The spindle extends down into the cavity.

The all-ways action unit is housed in the cavity drilled across the upper fuze body ending concavely in a dome. The open end is closed by a threaded plug with a similar dome on the inside. This cavity is filled by the striker and primer carrier assembly, the outer ends of which are domed. This assembly is similar to the all-ways action unit utilized in the A–7 (a). The assembly fits across the fuze and the arming spindle fits down through a hole in the striker holding the primer and striker apart. A spring also holds the two apart. A flash hole in the bottom of the cavity leads to delay train which is threaded into the base of the upper fuze body. This in turn leads through the lower fuze body to the gaine.

Operation: The safety fork is withdrawn and the vanes rotate causing the arming spindle to rise in the central hole and withdraw from the all-ways action unit. This leaves the striker and primer carrier separated only by the spring. On impact at any angle the striker and primer are cammed together by the force of inertia. The flash from the primer passes through the flash holes, ignites the delay which in turn ignites the relay on top of the gaine.

Type 1 Long-Delay Fuze C–3 (a)

Bombs in which used: Type 1 30-, 50-, 100-, 250-, 500-kg.

Markings:

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(Tokyo, April 1942)

Color: Unpainted steel.

Over-all length: 7¾ inches (visible length, 1½ inches).

Over-all width: 3½ inches.

Material of construction: Steel body, brass inside.

Position and method of fixing in bomb: Screwed into the modified nose of the type 1 Army bombs. (Right-hand thread.) Antiwithdrawal locking device is fitted to prevent removal.

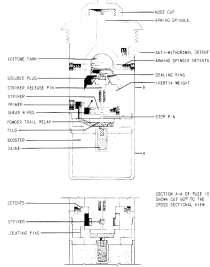
Components of explosive train: Primer, powder train relay, gaine, and booster.

Fuzes likely to be found with: E–1 (a).

Delay times: 2 hours to 24 hours (may be shorter or longer).

Threads: 2$\frac{3}{32}$ inches in diameter, 12 threads per inch.

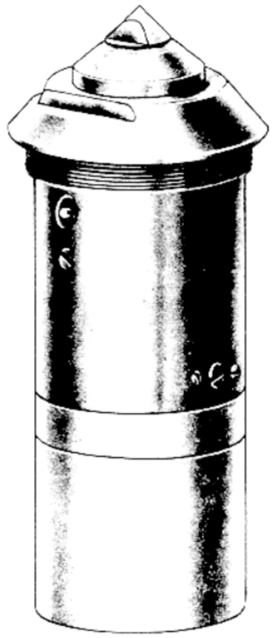
Description: The fuze consists of the fuze body, a nose cap which will not usually be found on a UXB, and a collar which joins the booster to the body. An antiwithdrawal detent prevents the fuze from being unscrewed by hand. An arming spindle is hollowed out to house a copper tank filled with acetone. The arming spindle is held in place by two spring-loaded detents. A screwdriver slot in the top of the spindle allows it to be turned from the safe position (+) to the armed position (—) marked in red meaning "firing point." The rotation of the spindle is regulated by the length of the grooves into which the spring-loaded detents are fitted. When in the armed position, the four cut-away segments of the spindle are in line with the raised portions of the inertia weight, thus allowing the latter to move up on impact.



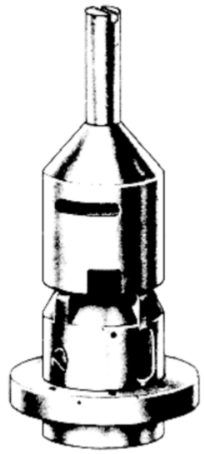
SECTION A-A OF FUZE IS SHOWN CUT 90° TO THE CROSS SECTIONAL VIEW

Figure 108—C-3 (a) Bomb Fuze.

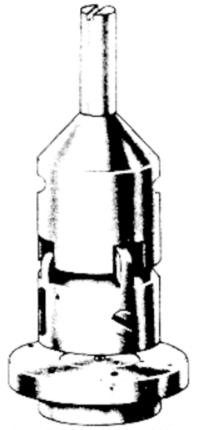
TOP VIEW WITHOUT NOSE CAP



ASSEMBLED FUZE



ARMING SPINDLE INERTIA WEIGHT ASSEMBLY UNARMED



ARMING SPLINDLE INERTIA WEIGHT ASSEMBLY ARMED

Figure 109—C-3 (a) Bomb Fuze.

The inertia weight is held by two shear wires which are sheared on impact. Two spring-loaded detents hold the inertia weight in position before impact. On impact, the inertia weight moves up toward the top of the fuze, and is locked in this position by these detents. This insures that the firing pin is in line with the primer. When the inertia weight moves up to the armed position, the safety detent remains behind, leaving the firing pin held only by the striker release pin bearing against the soluble plug. When this plug dissolves, the pin moves up, freeing the striker and allowing it to be pushed into the detonator by the spring behind the striker. A rubber sealing ring keeps the solvent from running throughout the fuze after the acetone tank is pierced.

Operation: Nose cap is removed. The arming spindle is turned to the firing point (—). This turns the spindle so that the inertia weight is free to move ahead on impact. The spindle is locked in position by spring detents. The nose cap may be replaced. On impact, the inertia weight shears the shear wires and moves ahead. The striker is lined up with the primer and is moved away from the stop pin. The acetone tank is pierced and the inertia weight is locked in the armed position by detents. After the acetone has softened the soluble plug, the striker release plunger moves out under spring action releasing the cocked striker which fires the primer.

Remarks: (*a*) Once the arming spindle is turned through 45° to the firing point, it cannot be turned back to safe. The spring-loaded detents prevent this. Also, after impact, the inertia weight has moved on to the spindle and will prevent rotation.

(*b*) If the cap is found on a UXB, the fuze may have been armed and the cap may have been replaced.

(*c*) The antiwithdrawal detent will usually prevent the fuze from being removed from the bomb. If the fuze is removed, the booster and gaine may be set off if the fuze operates later. Therefore, unscrew the booster and gaine immediately after withdrawing the fuze.

Note.—Actual time test run by Allied forces on the C–3 (a) types A, B, C, and D gave the following average delays:

Type A	32 minutes.
Type B	5 hours 3 minutes.
Type C	12 hours 42 minutes.
Type D	18 hours 45 minutes.

These tests were run under field conditions which would closely approximate actual dropping of the bomb.

Aerial-Burst Nose Fuzes D–1 (a) and D–1 (b)

Bombs in which used:
- 50-kg. size pamphlet bomb.
- 100-kg. size pamphlet bomb.

Color: Lamp black.

Over-all length: 7.4 inches.

Over-all width: 3.3 inches (vanes); 3.05 inches (body).

Material of construction: Aluminum body, brass vanes.

Position and method of fixing in bomb: None.

Components of explosive train: The detonator ignites the gaine which in turn ignites the gunpowder bursting charge.

Fuzes likely to be found with: None.

Delay times: None.

Description: The essential parts of this fuze are the generator, firing circuit, and the air pressure operated switch. The generator consists of a series of coils secured to a closing plate and four quarter section magnets encased within a brass sleeve which rides on a ball race seated on the coils. The vanes do not come off but are threaded on securely, and in rotation turn the magnets around the coils. The firing circuit consists of two plug leads which conduct the current from the generator to an air pressure operated switch. Leads to a squib plug into the circuit from the switch. The switch consists of two contact points. One point is attached to a pivoted lever and a leaf spring bears against this lever and tends to force the contact point against the other point on the setting screw.

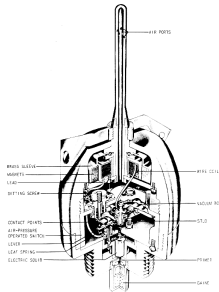


Figure 110—D-1 (a) and D-1 (b) Bomb Fuzes

A stud attached to an aneroid type metallic vacuum box bears against the other side of the lever, however, and tends to hold the contact points apart. By rotating the setting screw the distance between the contact points can be adjusted. Twelve small air ports permit air to enter and pass down the hollow spindle into the fuze.

Operation: On release from the plane, the arming wire is withdrawn from the holes in the arming vanes and the vanes are freed to rotate. An electric current is generated by the rotation of the magnets around the coils. Air entering the small holes in the spindle exerts pressure on the vacuum box causing it to contract and lift the stud from the switch lever. The leaf spring forces the lever up and thus closes the contact points. The circuit being complete, the squib fires.

The functioning altitude can be set by inserting the fuze in a testing apparatus and adjusting the setting screw in both directions until the contact points are just closed and a pilot light lights. The zero mark on the altitude scale is then placed at this point and the functioning altitude is set by rotating the pointers on the setting screw to the desired height.

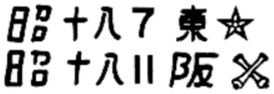
Remarks: The only apparent difference between the D–1 (a) and D–1 (b) is length; the D–1 (a) body being 3⅞ inches long and the D–1 (b), 4⅜ inches. In addition, this same fuze has been found with a bakelite body instead of aluminum, but is otherwise the same.

Type 1 Aerial-Burst D–5 (a), Type 1 Combination Fuze D–5 (b)

Bombs in which used:

D–5 (a)	D–5 (b)
Type 94 50- 100-kg. (and special).	Types 1, 2, and 3.
Type 3 50- 100-kg.	Aircraft Flare.
Type 92 15-kg.	
Type 99 30-kg.	

Markings:



Flare fuze (July 1943, Tokyo Army Arsenal)
Bomb fuze (November 1943, Osaka Army Arsenal)

Color: Brass.
Over-all length: 4 inches.
Over-all width: 2 inches.

Material of construction: Brass except for steel firing pins, spring, spring washers, and retaining screws.
Position and method of fixing in bomb: Screwed into nose.
Components of explosive train: Black powder magazine or high explosive gaine.
Fuzes likely to be found with: None.
Delay times: 3 to 40 seconds.
Threads: $1\frac{5}{64}$ inches in diameter, 13 threads per inch.

Description: The fuze body is made up of eight parts. The vane hub is secured to the upper fuze body by two retaining screws. These allow the vanes to rotate yet prevent the vanes from falling away. The upper fuze body screws onto an internal adapter ring which in turn screws around the lower fuze body. The upper powder train is fixed, being locked to the upper fuze body by a key pin. Two spring steel washers between the upper fuze body and the fixed powder train keep a working friction between the powder rings.

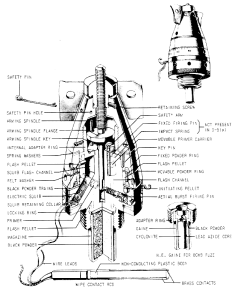


Figure 111—D-5 (a) and D-5 (b) Bomb Fuzes.

The lower movable powder train is separated from its adjacent parts by two felt washers. Both the upper and lower powder train rings slip down over the lower fuze body. The squib retaining collar is an L-shaped ring that fits around the lower fuze body. The knurled locking ring threads on the lower fuze body and serves to lock the fuze into the bomb. The magazine is filled with large grained powder and has a ⅜-inch hole through its base to allow the flash to reach the ignition charge of the flare proper. The arming spindle is $3\frac{7}{16}$ inches long. The upper portion is threaded for 1¾-inches to turn through the vane hub. At the end of the threaded portion is a ¾-inch flange. The tip of the lower portion of the spindle is split (forked). The gas operated, aerial burst, firing pin shoulders on the forked tip of the arming spindle which denies it access to the primer until the spindle is raised (armed). In the unarmed position the arming spindle flange holds the impact (movable) primer carrier down and away from its fixed firing pin by bearing against the safety arm of the carrier. The ⅝-inch long electric squib fits into the lower fuze body. Two 5-foot insulated single strand copper wires, and a 40-inch cord are attached.

Operation: On release, the wipe contact rod is pulled through the plane's contact points, firing the squib and thus initiating the powder train rings. The vanes rotate, turning the spindle up, thus freeing the striker, and the impact primer carrier. When the powder train has burned its course, the gas generated by the initiating pellet drives the firing pin forward against the creep spring and into the primer. A flash pellet relays this to the black powder magazine or gaine. If the aerial burst feature fails, the primer carrier moves against the fixed firing pin on impact.

Note.—The bomb fuze differs from the flare fuze in that it has a high-explosive gaine and adapter ring instead of a magazine, and the impact firing feature is left out.

Type 1 Anti-Withdrawal Fuze E–1 (a)

Bombs in which used: Type 1—50-, 100-, 250-, 500-kg.
Markings:

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(Osaka Army Arsenal, July 1943)

Color: Brass.
Over-all length: 4⅝ inches (with gaine).
Over-all width: 2 inches.

Material of construction: Striker, springs, screws, stop studs, trigger, and three spacers made of steel. All other parts made of brass.
Position and method of fixing in bomb: Screwed into tail fuze pocket.
Components of explosive train: Primer and standard Army type gaine.
Fuze likely to be found with: C–3 (a).
Delay times: No delay.
Threads: $1\frac{13}{16}$ inches in diameter, 8 threads per inch.

Description: The vanes, similar to those of the B–1 (a) are locked to the arming spindle by a setscrew. The arming spindle, housed in the conical shaped upper fuze body, is a round shaft threaded at the top with right-hand threads to attach to the vanes and at the bottom with finer left-hand threads to fit into the inertia block.

The spacing ring screws into the upper fuze body and is secured by screws to the lower fuze body. It serves to hold the inertia block part way down against the spring. The lower fuze body houses the firing mechanism and the primer cap. The trigger and the trigger spring are mounted on top of the lower fuze body. The trigger is pivoted on a screw threaded into the top of the lower fuze body. One end bears against the trigger spring; the other in the cocked position fits on the striker notch, preventing the spring loaded striker from firing. The trigger is prevented from pivoting by the inertia block against which it rests.

Operation: On release from the plane, the vanes rotate the arming spindle clockwise, unscrewing it from the inertia block, which is keyed to prevent rotation. The fuze is now armed. The flange of

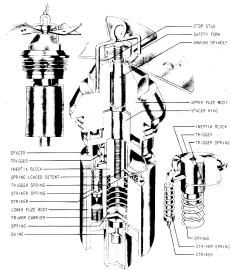

Figure 112—E-1 (a) Bomb Fuze.

the arming spindle prevents the spindle and vanes from falling away.

On impact, the inertia block moves down against the spring and is held below the surface of the lower fuze body by the spring loaded detent. The spring loaded trigger arm is released and pivots out beyond the fuze body a distance of $\frac{1}{64}$-inch where it encounters the wall of the fuze pocket. This movement of $\frac{1}{64}$-inch is not sufficient to release the striker. The fuze will not fire as

long as it remains in the bomb. If withdrawal is attempted, the trigger arm will snap into the annular groove as the last thread of the fuze pocket is disengaged. This movement of the trigger releases the spring loaded striker and it hits the primer.

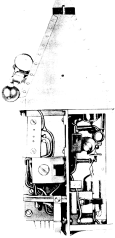

Figure 113—Remote-Control Radio Fuze.

Remote Control Radio Fuze

This fuze is a Japanese Army attempt to produce a remotely controlled bomb detonating device which would allow the operator to detonate the bomb at any time during its flight. It operates on electronic principles, and is fired on reception of the proper radio signal from the operator.

Physically, the fuze is large and cumbersome, being 9 inches in length, exclusive of any provision for an explosive gaine. The lower portion is in the shape of a rectangular prism 3⅜ x 3⅜ x 4½ inches. The top 4¼-inches is in the shape of a pyramid. A set of anemometer vanes is mounted on the side of the pyramidal portion. The electronic equipment is protected by an outer cover of sheet aluminum.

The device is apparently intended to be operated by an observer in the airplane from which the bomb is dropped, equipped with a sending device to produce the required radio firing signal. Arming is accomplished by means of arming vanes which allow two arming switches to close after air travel.

This fuze was still in the experimental stage, and no attempt had been made to fit it to a bomb. A large bomb, possibly of the incendiary shrapnel type, to be used against enemy bomber formations is indicated.

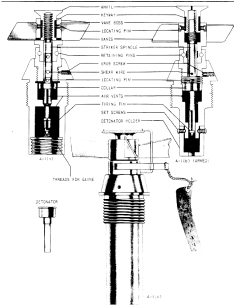

Figure 114—A-1 (a), A-1 (b), and A-1 (c) Bomb Fuzes.

NAVY BOMB FUZES

A–1(a), A–1(b), and A–1(c) Nose Fuzes

Bombs in which used:
- A–1(a)—Probably interchangeable with A–3 (a).
- A–1(b)—Type 99 No. 3 Mk 3.
- A–1(c)—Type 98 No. 80 land.
- No. 80 Model 1 and No. 50 Model 2 ordinary.

Japanese designation:
- A–1(a)—Type 2 Nose Fuze Model 2.
- A–1(b)—Type 90 Nose Initiator.
- A–1(c)—Type 2 Nose Fuze Model 1.

	A–1 (a)	A–1 (b)	A–1 (c)
Color	Natural brass	Natural brass	Brass upper body. Lacquered lower body.
Over-all length	6 inches	6 inches	7⅝ inches.
Over-all width	2¼ inches	2¼ inches	$2\frac{5}{16}$ inches.
Material of construction	Brass	Brass	Brass except for steel setscrew, striker point and locating pin.

Position and method of fixing in bomb: Threaded into nose of bomb.

	A–1 (a)	A–1 (b)	A–1 (c)
Components of explosive train	Standard Navy gaine.	Primer and detonator.	Standard Navy gaine.
Fuzes likely to be found with	Navy tail fuzes except C–1 (a).	Possibly D–2 (b).	B–3(b) or possibly B–2 series.

Delay times: Probably none.

Threads: All three fuzes 1⅞ inches in diameter, 10 threads per inch.

Description: The upper portion of the body houses the vane boss which is secured by retaining pins and is free to rotate. It is threaded into the lower body and held by a grub screw. Through the upper and lower bodies passes the striker threaded to the anvil which is keyed to the vane boss. The anvil turns when the vane boss is rotated and threads up the striker until the keys shoulder in the partial keyways. Through the striker passes a shear wire which breaks on impact and a locating pin which slides out of a slot in the upper body on impact.

Operation: On release, the arming pins are pulled out, the vanes and vane boss turn the anvil which threads upward and away from the fuze (due to left-hand threads). The vanes do not come off because the vane boss to which they are attached, is held by retaining pins and can only rotate. The anvil is stopped by keys when it reaches the limit of its partial keyways. Impact pushes anvil back. Spindle is forced downward. Shear wire is sheared, and the firing pin impinges on the primer.

Remarks: A–1 (a): May arm in 5 revolutions of the arming vanes.

A–1 (b): This fuze was used in a 32-kg. bomb employed as an antivehicle mine in beach defenses against landing forces attempting a seaward invasion.

A-1 (c): This fuze is similar to the A-1 (a). It differs in that the fuze body below the thread is substantially longer while the fuze body above the threads is only slightly longer than that of the A-1 (a). The striker spindle is longer, the diameter of the anvil head is larger, and the arming vanes are longer.

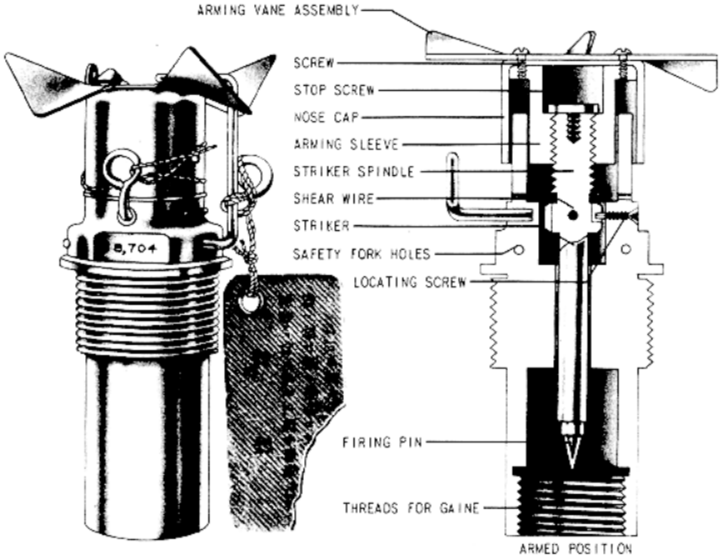

Figure 115—A-3 (a) Bomb Fuze.

Type 97 Mk 2 Nose Fuze Model 2 A-3 (a)

Bombs in which used:
- Type 97 No. 6 land.
- Nos. 3, 6, and 25 ordinary Model 2.
- Type 99 Nos. 6 and 25 ordinary Model 1.
  - Mk 1 bombs.
  - Mk 2 Nos. 6 and 25.
  - Mk 6, 8, and 26.

Markings:

One side—

Other side, 444

Color: Natural brass; lower fuze body shellacked.

Over-all length: 5½ inches.

Over-all width: 2 3/16 inches; vane span, 3½ inches.

Material of construction: Brass except steel arming vanes and firing pin.

Position and method of fixing in bomb: Screwed clockwise into nose; there are wrench flats on body. No antiwithdrawal locking device is used.

Components of explosive train: Standard Navy gaine or magazine.

Fuzes likely to be found with: B–2 (a), B–3 (a), D–2 (a), D–2 (b), D–2 (c).

Delay times: Incorporated in Navy gaines.

Threads: 10 threads per inch; diameter, 1⅞ inches.

Description: The fuze consists of three main parts: the body, the striker spindle, and the arming vane assembly. The striker spindle is located in the fuze body by means of a locating screw and a shear wire which prevent the spindle from rotating or moving forward until impact. The upper portion of the spindle is threaded, while a steel firing pin is screwed into the lower end. The arming vane assembly consists of a nose cap, arming vanes, and arming sleeve. The arming sleeve, internally threaded, screws onto the spindle and its length of travel is limited by a stop screw threaded into the top of the spindle. To this sleeve, the nose cap and arming vanes are attached by four short screws. The lower end of the fuze body is internally threaded to take the standard Japanese gaine or magazine.

A heavy wire eyelet is attached to the side of the fuze body and serves as a guide for the starting wire. The starting wire is soldered to the nose cap in two places and gives an initial turn to the arming assembly when the bomb is dropped. A safety fork fits into the upper portion of the fuze body, one prong of which extends up through eyelets of arming vane assembly to prevent premature vane rotation.

Operation: On release of bomb, the arming wire pulls the starting wire through the eyelet, breaking it loose at the soldered points and simultaneously imparting an initial rotation to the arming vane assembly. In seven revolutions, the arming sleeve rises up the striker spindle to lock against the stop screw and arm the fuze. On impact, the entire assembly (vanes, nose cap, sleeve and spindle) are driven inward, shearing the shear wire, and the firing pin pierces the primer.

Remarks: 1. The threads on the striker spindle are 12 threads per inch. 2. A variation of this fuze has been found with a fiber nose cap. Soldered around the cap with holes located over six projections on the cap is a thin steel band to which is soldered the starting wire. The arming sleeve, striker spindle and shear wire are brass with the remainder of the fuze unpainted steel alloy. All dimensions are the same as the standard A–3 (a). Designation: Type 97, Mk 2, Model 1.

Type 1 Nose Fuze Model 2 A–3 (b)

Bombs in which used:
  Type 97 No. 6.
  Nos. 3, 6, and 25 ordinary Model 2.
  Type 99 Nos. 6 and 25 ordinary Model 1.
    Mk 1 Bombs.
    Mk 2 No. 6 and 25.
    Mk 6, 8, and 26.

Markings:
  On wrench flats:

One side—

Other side, 466.

Color: Brass colored over all except for steel colored vanes.

Over-all length: 6⅝ inches.

Over-all width: 2¼ inches; vane span 3½ inches or 4⅝ inches.

Material of construction: Brass except steel arming vanes and firing pin.

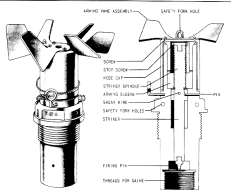

Figure 116—A-3 (b) Bomb Fuze.

Position and method of fixing in bomb: Screwed clockwise into nose; there are spanner wrench flats on side of body. No anti-withdrawal or locking device used.

Components of explosive train: Employs standard Navy gaine or magazine.

Fuzes likely to be found with: B-2(a); B-3(a).

Delay times: Incorporated in Navy gaine.

Threads: 10 threads per inch; diameter, 1⅞ inches.

Description: The fuze consists of three parts: the fuze body, the striker spindle, and the nose cap arming assembly.

The fuze body contains the striker spindle which is held in place by a shear wire and a brass locating pin. The lower end of the body is internally threaded to take a standard Navy gaine or magazine. A safety fork fits into the upper side of the fuze body, one prong of the fork extending up through eyelets in the vane assembly to prevent premature rotation. The upper part of the brass striker spindle is externally threaded for the arming sleeve and has a stop screw threaded into the top end. The steel firing pin is screwed into the lower end of the spindle. The nose cap arming assembly consists of the arming vanes, brass nose cap, and arming sleeve. The arming sleeve, internally threaded, screws onto the striker spindle and its length of travel is limited by the stop screw at the top end of the spindle. The nose cap and arming vanes are secured to the arming sleeve by four small screws.

A heavy wire eyelet is attached to the side of the fuze body and serves as a guide for the starting wire which is soldered to the nose cap at two points and gives an initial turn to the arming assembly.

Operation: On release of bomb, the arming wire pulls the starting wire through the eyelet, breaking it loose at the soldered points and simultaneously imparting an initial rotation to the arming vane assembly. The arming vane assembly rotates up on the striker spindle and locks against the stop screw, thereby arming the fuze. On impact, the striker spindle is forced inward, shearing the shear wire, and the firing pin pierces the primer.

Remarks: 1. The threads on the striker spindle are 25 threads per inch. 2. Two different types of arming vanes have been used on this fuze, the vanes varying as to size, shape, and pitch; each type has six blades.

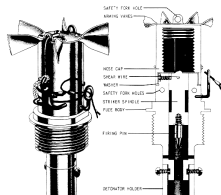

Figure 117—A-3 (c) Bomb Fuze.

Type 2 Nose Initiator A-3 (c)

Bombs in which used: Mk 3 No. 3.

Markings:

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Color: Natural steel color over all except for brass nose cap.

Over-all length: 6 inches (including detonator holder).

Over-all width: 2¼ inches; vane span, $3\frac{11}{16}$ inches.

Material of construction: Steel with brass striker spindle and nose cap.

Position and method of fixing in bomb: Screws clockwise into nose; there are spanner wrench flats on side of body. No locking or anti-withdrawal device.

Components of explosive train: Primer cap and detonator.

Fuzes likely to be found with: D–2 (a), D–2 (b), D–2 (c).

Delay times: Probably none.

Threads: 10 threads per inch; diameter, 1⅞ inches.

Description: The fuze consists of four main parts: the fuze body, the striker spindle, the nose cap, and the detonator holder. The fuze body contains the striker spindle which is held in place by a shear wire and a locating screw. The lower end of the body is grooved to receive the screws in the detonator holder. A safety fork fits into the upper side of the fuze body, one prong of the fork extending up through eyelets in the vane assembly to prevent premature vane rotation.

The brass striker spindle is of one piece construction except for the steel firing pin which screws into the lower end. A threaded flange, 1 inch in diameter, at the top of the spindle screws into the nose cap. The spindle is drilled to take the shear wire; a keyway in the side of the spindle receives the locating screw which prevents rotation or upward movement.

The brass nose cap, unlike that of the A–3 (a), is of one-piece construction. The cap is internally threaded to receive the flange of the striker spindle. A six-bladed vane assembly is secured to the cap by four screws. The usual type starting wire is soldered to the side of the cap so that a rotary motion will be imparted to the vane assembly when the bomb is dropped. The detonator holder, similar to that of the A–1(b), is affixed to the lower end of the fuze body by two screws.

Operation: On release from the plane, the starting wire is pulled out through the eyelet, breaking it loose from the soldered contacts with the nose cap. Simultaneously, an initial rotation is imparted to the nose cap which rotates up on the striker spindle flange. The fuze is armed in approximately 28 revolutions and the vane and cap fall away after 37 revolutions. On impact; the striker spindle is forced inward, shearing the shear wire, and the firing pin pierces the primer.

Remarks: 1. The threads on the striker spindle flange are 26 threads per inch. 2. The appearance of this fuze (armed) in a UXB will differ materially from that of the A–3 (a). The visible parts will be the threaded brass striker spindle flange possibly resting flush against the top of the fuze body; the nose cap and vanes fall away after 37 revolutions.

Type 97 Mk 2 Nose Fuze Model 1 A–3 (d)

Bombs in which used: No. 80 land, No. 80 ordinary Model 1.

Markings:

One side, 2660.

Other side—

Color: Natural brass, maroon lacquered lower body. Steel vanes.

Over-all length: 7⅜ inches.

Over-all width: 2¼ inches; vane span, 4¾ inches.

Material of construction: Brass except for steel vanes and firing pin.

Position and method of fixing in bomb: Screwed clockwise into nose. There are spanner wrench flats on side of body. No anti-withdrawal or locking device is used.

Component of explosive train: Employs standard Navy gaine or magazine.

Fuzes likely to be found with: Probably B–3 (b).

Delay times: Incorporated in Navy gaine.

Threads: 10 threads per inch; diameter, 1⅞ inches.

Description: The fuze consists of three main parts: the body, the striker spindle, and the arming vane assembly. The striker spindle is located in the fuze body by means of a locating

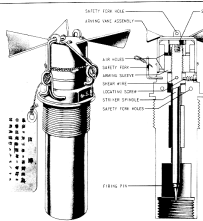


Figure 118—A-3 (d) Bomb Fuze.

screw and a shear wire which prevent the spindle from rotating or moving forward until impact. The upper portion of the spindle is threaded while a steel firing pin is screwed into the lower end. The arming vane assembly consists of a nose cap, arming vanes, and arming sleeve. The arming sleeve internally threaded, screws onto the spindle and its length of travel is limited by a stop screw threaded into the top of the spindle. To this sleeve, the nose cap and arming vanes are attached by four short screws. The lower end of the fuze body is internally threaded to take the standard Japanese gaine or magazine.

A heavy wire eyelet is attached to the side of the fuze body and serves as a guide for the starting wire. The starting wire is soldered to the nose cap in two places and gives an initial turn to the arming assembly when the bomb is dropped. A safety fork fits into the upper portion of the fuze body, one prong of which extends up through eyelets of arming vane assembly to prevent premature vane rotation.

Operation: On release of bomb, the arming wire pulls the starting wire through the eyelet, breaking it loose at the soldered points and simultaneously imparting an initial rotation to the arming vane

assembly. In seven revolutions, the arming sleeve rises up the striker spindle to lock against the stop screw and arm the fuze. On impact, the entire assembly (vanes, nose cap, sleeve and spindle) is driven inward, shearing the shear wire, and the firing pin pierces the primer.

Remarks: This fuze is similar to the A–3 (a) with the following exceptions: (*a*) the maroon lacquered lower fuze body is 1 7/16 inches longer than that of the A–3 (a); (*b*) the striker spindle of the new fuze is longer than that of the A–3 (a) to match the elongated lower fuze body; (*c*) the vanes have a span of 4¾ inches as compared to the 3½ inch vane span of the A–3 (a).

The threads on the arming spindle are 12 threads per inch.

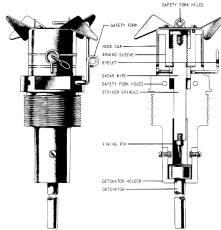


Figure 119—A–3 (e) Bomb Fuze.

Type 3 Nose Initiator A–3 (e)

Bombs in which used: Temporarily designated type 99 No. 6 smoke.
Color: Steel, except for brass nose cap.
Over-all length: 5⅜ inches (less detonator).
Over-all width: 2⅛ inches; vane span, 3⅝ inches.
Material of construction: Steel except for brass nose cap, arming sleeve, and striker spindle.
Position and method of fixing in bomb: Screwed into nose fuze pocket and tightened with a wrench.
Components of explosive train: Detonator.
Delay times: None.
Threads: 10 threads per inch, RH, 1⅞ inches in diameter.

Description: The fuze consists of the fuze body, arming vane assembly, striker spindle and detonator holder.

The fuze body is of one-piece construction. It houses the striker spindle which is held in position by a locating screw and a brass shear wire. The upper portion of the spindle is threaded and a steel firing pin is screwed into the lower end. The arming vane assembly consists of a nose cap, arming vanes and arming sleeve. The arming sleeve is internally threaded and screws onto the spindle. Its length of travel is limited by a stop screw threaded into the top of the spindle. The nose cap and four arming vanes are attached to this sleeve by four short screws.

The lower end of the fuze body is grooved circumferentially. The cup-like detonator holder is secured to the fuze body by two screws which fit into this groove.

A heavy wire eyelet is attached to the side of the fuze body and serves as a guide for the starting wire. The starting wire is soldered to the nose cap in two places and gives an initial turn to the arming assembly when the bomb is dropped. A safety fork fits into the upper portion of the fuze body, one prong of which extends up through eyelets of arming vane assembly to prevent premature vane rotation.

Operation: On release of bomb, the arming wire pulls the starting wire through the eyelet, breaking it loose at the soldered points and simultaneously imparting an initial rotation to the arming vane assembly. In seven revolutions, the arming sleeve rises up the striker spindle to lock against the stop screw and arm the fuze. On impact, the entire assembly (vanes, nose cap, sleeve, and spindle) is driven inward, shearing the shear wire and the firing pin pierces the detonator.

Type 2 No. 50 Ordinary Bomb Model 1 Fuze A–3 (f)

Bombs in which used: Type 2 No. 50 ordinary bomb, Model 1.
Color: Natural steel except for brass nose cap.
Over-all length: 10 inches.
Over-all width: 2 inches; vane span, 3½ inches.
Material of construction: Steel except for brass nose cap and arming sleeve.
Position and method of fixing in bomb: The fuze is screwed into the nose of the bomb and tightened with a spanner wrench.
Components of explosive train: Incorporated in Navy gaine.
Fuzes likely to be found with: B–2 (a), slightly modified.
Delay times: Incorporated in Navy gaine.
Threads: 10 threads per inch; RH; diameter, 1⅞ inches.

Description: The fuze consists of three main parts: the body, striker spindle and arming vane assembly.

The striker spindle is housed in the fuze body and is held in position by a locating screw and a shear wire. The spindle is made in three sections. The upper section, which is externally threaded to take the arming sleeve, is internally threaded in the top to take the stop screw and internally threaded in the bottom to take the middle section of the spindle. The lower section of the striker spindle is internally threaded to take the middle

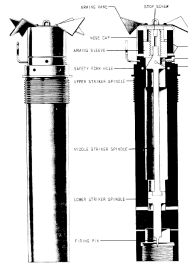


Figure 120—A-3 (f) Bomb Fuze.

section. The arming vanes and nose cap are attached to the arming sleeve by four screws.

A heavy wire eyelet is attached to the side of the fuze body and serves as a guide for the starting wire. The starting wire is soldered to the nose cap in two places and gives an initial turn to the arming assembly when the bomb is dropped. A safety fork fits into the upper portion of the fuze body, one prong of which extends up through eyelets of arming vane assembly to prevent premature vane rotation.

Operation: On release of bomb, the arming wire pulls the starting wire through the eyelet, breaking it loose at the soldered points and simultaneously imparting an initial rotation to the arming vane assembly. In seven revolutions, the arming sleeve rises up the striker spindle to lock against the stop screw and arm the fuze. On impact, the entire assembly (vanes, nose cap, sleeve, and spindle) is driven inward, shearing the shear wire, and the firing pin pierces the primer.

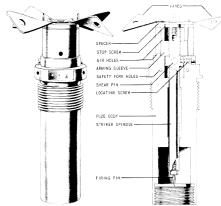


Figure 121—A-3 (g) Bomb Fuze.

A-3 (g) Nose Fuze

Bombs in which used: Baka bomb.
Color: Natural steel.
Over-all length: 7⅛ inches.
Over-all width: 2³⁄₆₄ inches.
Material of construction: All steel except for the brass arming sleeve, striker spindle and locating screw.
Position and method of fixing in bomb: Screwed clockwise into the nose. No antiwithdrawal or locking device used.
Components of explosive train: Incorporated in Navy gaine.
Fuzes likely to be found with: B-9 (a), B-10 (a).
Delay times: Incorporated in Navy gaine.
Threads: 10 threads per inch, RH, 1⅞ inches diameter.

Description: The fuze consists of three main parts: the body, the striker spindle and the arming vane assembly.

The striker spindle is positioned in the one piece fuze body by a locating screw and steel shear pin $\frac{15}{64}$ inch in diameter. The upper portion of the spindle is threaded externally and internally and a steel firing pin is screwed into the lower end.

The arming vane assembly consists of vanes, spacer disc, arming sleeve and stop screw. The internally threaded arming sleeve screws onto the striker spindle. A stop screw threaded into the upper end of the spindle prohibits the sleeve from screwing off the spindle. The arming vanes and spacer disc are attached to the sleeve by four short screws. There is a $\frac{1}{4}$ inch hole in each vane $\frac{1}{4}$ inch from its end.

A safety fork fits into the upper portion of the fuze body, one prong of which extends through the eyelets of the arming vane assembly thereby holding it stationary.

Operation: When the Baka bomb is released from the plane, an arming wire is withdrawn from the holes in the arming vanes. The vanes rotate causing the arming sleeve to rise up on the striker spindle and lock against the stop screw. On impact with a solid object the arming vane assembly and striker spindle are driven inward shearing the steel shear pin and the firing pin pierces the primer.

Remarks: This fuze is similar to the A-3 (d) with the following exceptions: (a) the nose cap is replaced by a spacer disc; (b) the shear wire is replaced by a shear pin; (c) there is no flange on the fuze body above the threads; (d) there is no starting wire or eyelet on the fuze body.

A-5 (a) Nose Fuze

Bombs in which used: 1-kg. practice bomb.
Color: Black, may have brass band.
Over-all length: $2\frac{13}{16}$ inches (less booster).
Over-all width: 3 inches (including fuze housing).
Material of construction: Cast iron.
Position and method of fixing in bomb: Fixed in the nose of the bomb.
Components of explosive train: A primer and a booster are present.
Fuzes likely to be found with: None.
Delay times: None.

Description: The fuze body is inside the nose of the bomb and cannot be seen; it is part of the nose of the bomb. The striker head is attached to the spindle which has an integral firing pin. In the unarmed position the striker is held away from the detonator by a safety screw pin and a shear wire. When the bomb is attached to the bomb rack a small arm depresses a spring-loaded safety plunger, the shaft of which fits into a hole in the striker spindle. The safety screw pin is then withdrawn.

Operation: On release from the plane the spring-loaded safety plunger is forced out of the striker spindle and the fuze is armed. On impact the striker assembly is driven inward shearing the shear wire and the firing pin pierces the primer.

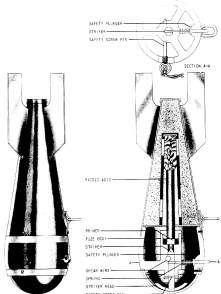


Figure 122—A-5 (a) Bomb Fuze.

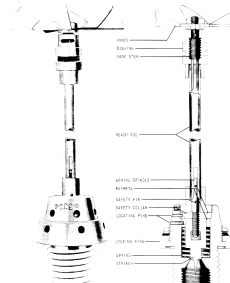


Figure 123—B-2 (a) Bomb Fuze.

Type 99 No. 25 Ordinary Bomb Fuze B–2 (a)

Bombs in which used: Type 99 No. 25 ordinary.
Markings:

Color: Chromium plated.

Over-all length: $4\frac{5}{8}$ inches (without the arming spindle extension).
Over-all width: $2\frac{9}{64}$ inches.
Material of construction: Steel, except locking ring, safety collar, and spindle.
Position and method of fixing in bomb: The fuze is screwed into the tail of the bomb and tightened with a spanner wrench. A locking ring is then screwed down to secure the fuze.
Components of explosive train: The standard Japanese gaine is employed.
Fuzes likely to be found with: Navy nose fuze A–3 (a).
Delay times: Incorporated in the Navy gaines.
Threads: $2\frac{9}{64}$ inches in diameter, 4 threads per inch.

Description: The fuze body houses the safety collar, the striker, the arming spindle and the spring. Six spanner holes are found in both the body and the locking ring. The arming assembly consists of a long reach rod connecting the arming spindle and the vanes. The lower end of the spindle screws through the top of the fuze body and the safety collar into the striker.

Operation: On release from the plane, the vanes rotate, unscrewing the arming spindle from the striker. On impact, the striker moves against the action of the spring and pierces the primer in the gaine to set off the exploder system.

Remarks: This fuze has been recovered only in the bomb listed above.

Variations of B–2 (a) have been found with:

1. Chromium plated body, brass locking ring, locating pins on same side;
2. Chromium plated body, chromium plated steel alloy locking ring, locating pins on same side;
3. Body and locking ring made of zinc plated steel alloy, locating pins on same side;
4. Body shoulders straight rather than sloping. Distance from top of shoulder to locking ring threads is 1 inch; two locating screw pins 180° apart; brass locking ring; body of unplated steel.

Type 99 No. 80 Mk 5 Bomb Fuze B–2 (b)

Bombs in which used: Type 99 No. 80 Mk. 5.
Markings:

Color: Unpainted steel.
Over-all length: $5\frac{9}{16}$ inches.
Over-all width: $3\frac{9}{32}$ inches (including locking ring).
Material of construction: Steel except for brass arming spindle and brass safety collar.
Position and method of fixing in bomb: Two fuzes are screwed into the base plate of the bomb and secured by the locking ring.
Components of explosive train: Incorporated in a large Navy gaine.
Fuzes likely to be found with: One other B–2 (b).
Delay times: 0.2-second delay incorporated in Navy gaine.
Threads: $2\frac{13}{32}$ inches in diameter; 4 threads per inch.

Description: The fuze body houses the striker, the spring, the safety collar, and the arming spindle. The upper end of the body is internally threaded, right-hand, to receive the bushing which

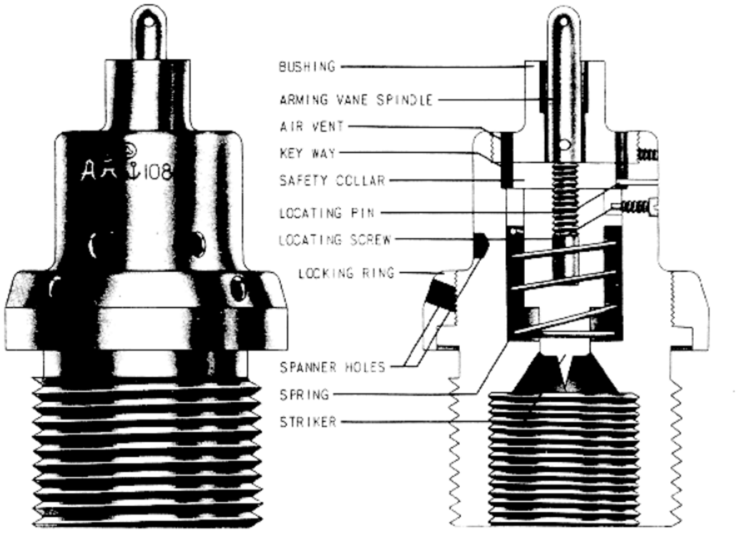


Figure 124—B-2 (b) Bomb Fuze.

secures the safety collar in position. The arming assembly consists of the vanes and a long reach rod which slide-fits over the arming spindle. A locking ring screws down over a shoulder of the body to secure the fuze in the bomb.

The safety collar and the top of the striker are internally threaded, left-hand, to receive the arming spindle. The collar rests on a shoulder of the fuze body and prevents the striker from moving downward when fuze is unarmed. The striker and safety collar are prevented from rotating by the locating screw and locating pin respectively.

Operation: On release from the plane, the arming vanes rotate, unscrewing the arming spindle from the striker. On impact the striker moves against the spring and pierces the primer in the gaine.

Remarks: The fuze uses an oversize Japanese Navy gaine in which is incorporated the primer, slight delay, detonator and booster.

The arming assembly is similar to the B-2 (a) except that the arming vane span of the B-2 (b) is only $3\frac{13}{16}$ inches as compared to the $4\frac{11}{16}$ inches span of the vanes used with the B-2 (a),

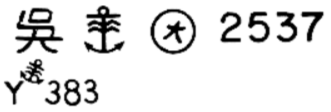
A small model of the B-2 (b) has been recovered in a 250-kg. Ordinary bomb, having a thread diameter of $2\frac{9}{64}$ inches.

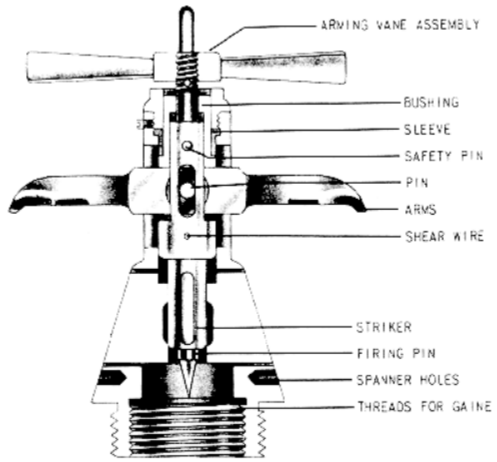
Type 15 Tail Fuze Model 2 and Model 1
B-3 (a) and B-3 (b)

Bombs in which used:

B-3 (a) No. 25 Model 2 ordinary.
B-3 (b) No. 50 Model 2 ordinary.
No. 80 Model 1 ordinary.

Markings:





CROSS SECTION OF B-3(a)

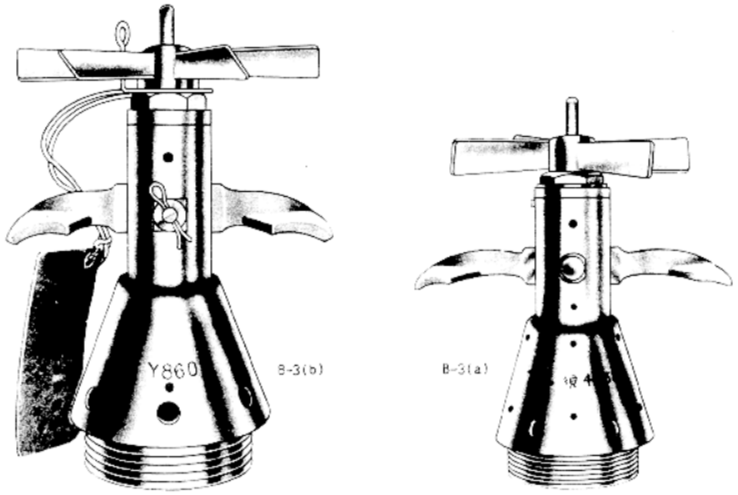


Figure 125—B-3 (a) and B-3 (b) Bomb Fuzes.

	B–3 (a)	**B–3 (b)**
Color	Brass	Brass.
Over-all length	$5\frac{5}{8}$ inches.	$7\frac{5}{16}$ inches.
Over-all width	$2\frac{3}{8}$ inches	$3\frac{1}{2}$ inches.

Material of construction: Brass except for steel sleeve, steel pivot for arms, and steel firing pin.
Position and method of fixing in bomb: Threaded into tail cone. Tightened with spanner wrench.
Components of explosive train: Employs standard Navy gaine.

	B–3 (a)	**B–3 (b)**
Fuzes likely to be found with:	A–3 (a) in nose.	Probably A–1 (c) in nose.

Delay times: Incorporated in the gaine.

	B–3 (a)	**B–3 (b)**
Threads	$1\frac{31}{32}$ inches in diameter, 12 threads per inch.	3 inches in diameter, 8 thread per inch.

Description: Principal parts are the body, the bushing which threads into the upper end of the body, the sleeve housed within the bushing, the striker which is threaded to take the vanes, and the arms which pivot on a steel pin extending through the body. When unarmed, the striker is prevented from moving down by the safety pin, the safety fork, the shear wire, and the arming vanes. The arms are prevented from moving by the sleeve which in turn is held in place by the arming vanes. The fuze body is internally threaded for the standard Navy gaine. Six spanner holes are drilled in the body.

Operation: On loading in the plane, the safety pin and the safety fork are removed. The vanes are prevented from rotating by an arm on the bomb rack. On release, the vanes rotate up and off leaving the sleeve free to rise. The striker is held up by only a shear wire. On impact, inertia forces the arms down against the shoulder of the striker, the shear wire is sheared, and the firing pin pierces the primer. Because both arms pivot about the stationary pin and extend through the body, pressure upward against the arms would force the short ends of the arms down against the striker and thereby shear the shear wire. Two-way action is thus achieved.

Remarks: After impact, a slight movement of the arms is liable to force the firing pin into the primer. The B–3(b) is similar to the B–3(a) except that all parts are larger and it lacks one minor safety pin hole at the top of the striker spindle. The diameter of the threads for the fuze pocket is larger than that of any other Japanese Navy fuze, but the fuze is internally threaded to take the standard Navy gaine. The fuze appears to be designed for use in large bombs—probably 500 kg. and over. Increased size of the fuze may provide greater certainty of arming and of firing despite the greater disruptive force of impact of the larger bomb.

B–5 (b) Tail Fuze

Bombs in which used: 1 kg. hollow-charge bomb.
Color: Aluminum.
Over-all length: $2\frac{5}{16}$ inches (less booster).
Over-all width: $1\frac{3}{4}$ inches.
Material of construction: Steel.
Position and method of fixing in bomb: Screwed into base of bomb body.
Components of explosive train: Gaine containing detonator and booster.
Fuzes likely to be found with: None.
Delay times: Instantaneous.

Description: The fuze body which houses the striker is externally threaded at the base to screw into the bomb body and at the top for the body cap. The cap screws onto the body and is

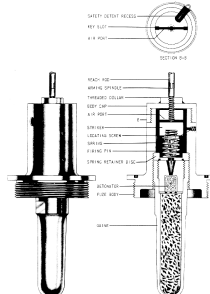


Figure 126—B-5 (b) Bomb Fuze.

threaded to receive the arming spindle which further screws into the striker, holding it in position. There are three grooves in the striker, two of which act as air vents, and one as a keyway. In the unarmed position the striker is held in the safe position by a safety detent and the arming spindle. An arming wire passes through the vanes preventing rotation and extends down to lock the safety detent against the pressure of the safety detent spring. A thin metal disc attached to the arming wire and lying just over the vanes inside the circular tail brace acts as a drogue to withdraw the arming wire when the bomb falls. When armed, the striker is held away from the detonator by a spring.

Operation: When bomb is released from the container, the pressure of air against drogue forces it from bomb and withdraws the arming wire. The safety detent spring then ejects the safety detent from side of fuze. The vanes rotate and unscrew the threaded arming spindle, freeing the striker. (This spindle is threaded with a left-hand thread.) On impact, striker carries forward and drives the firing pin into the detonator.

Remarks: Refer to drawing 1 kg. bomb.

B–5 (c) Tail Fuze

Bombs in which used: Navy 1-kg. A/P bomb.
Color: Aluminum.
Over-all length: 2¼ inches (less gaine and arming stem).
Over-all width: 2⅛ inches.
Material of construction: Aluminum alloy.
Position and method of fixing in bomb: Screws into base of bomb body.
Components of explosive train: Same gaine as is used with the B–5 (b).
Fuzes likely to be found with: None.
Delay times: Instantaneous.

Description: The fuze is integral with the tail section, and is very similar to the B–5 (b) except for a reduction gear system used to slow down the arming process. The fuze is composed of the following parts: (1) Two small arming vanes held in the safe position by a drogue; (2) an arming stem; (3) gear frame containing the arming stem gear; intermediate gear, pinion gear and arming spindle gear; (4) detent retaining pin; (5) spring-loaded safety detent; (6) arming spindle; (7) heavy inertia striker; (8) spring; and (9) fuze body.

Operation: When the bomb falls free from the container, the drogue retaining the vanes is carried away by the wind, allowing the vanes to rotate. The motion of the vanes is transmitted through the reduction gear system to the spindle which is threaded out of the striker. To prevent rotation of the striker, a locating pin and keyway system are incorporated in the fuze body and striker. As the spindle rises, it also lifts the gear frame to which is secured a pin retaining the safety detent. The safety detent, which fits through the fuze body into the striker and holds it in position, is spring-loaded outward, and removal of the safety detent pin permits it to fly out. With the spindle and detent removed, the heavy striker is held up only by a weak spring, which it overcomes on impact, initiating the gaine.

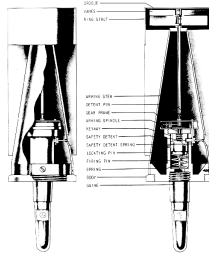


Figure 127—B-5 (c) Bomb Fuze.

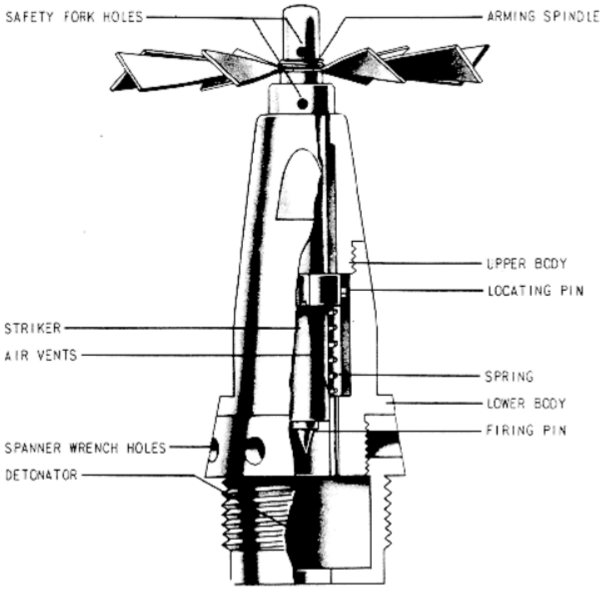


Figure 128—B–6 (a) Bomb Fuze.

Type 97 Rail Initiator B–6 (a)

Bombs in which used: 31-kg. practice bomb.
Markings:

Color: Brass.
Over-all length: 3⅝ inches.
Over-all width: 1¼ inches, vane width, $2\frac{5}{16}$ inches.
Material of construction: Brass except steel firing pin and spring.
Position and method of fixing in bomb: Screwed into tail fuze pocket and tightened with spanner wrench.
Components of explosive train: Not known.
Fuzes likely to be found with: None.
Threads: $1\frac{3}{64}$ inches in diameter, 20 threads per inch.

Description: The upper portion of the body acts as a guide for the arming spindle. The lower portion of the body contains the light spring. The firing pin is screwed into the end of the striker. The lower portion of the fuze has a combination spanner ring and detonator cup screwed to it. Around the striker, four air vents are drilled. Two vents are also located on the striker collar. These vents allow the striker to move against the primer on impact without any cushion effect caused by the air in the striker channel. The arming vane assembly has eight vanes.

Operation: On release from the aircraft, a U-shaped safety fork is withdrawn from the two holes in the arming spindle. The vanes rotate twelve times and fall free, leaving the striker held back by the light spring. The arming spindle is prevented from rotating by a small locating pin which fits in a keyway in the lower portion of the fuze body. On impact, inertia causes the striker to move against the spring and to pierce the primer.

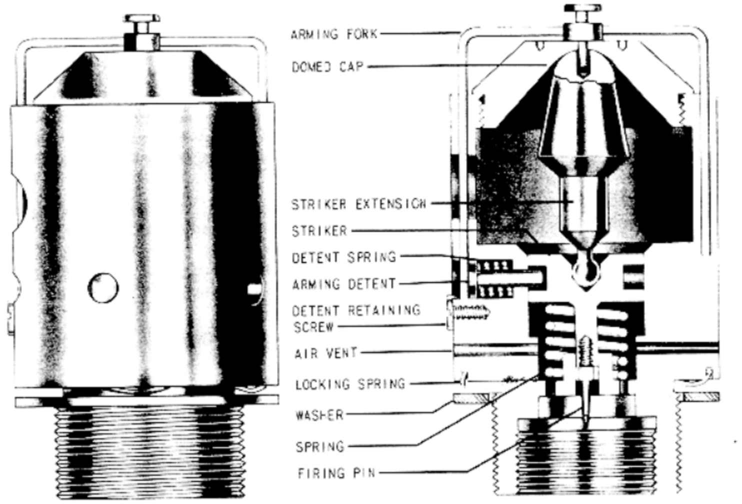


Figure 129—B-9 (a) Bomb Fuze.

B-9 (a) Tail Fuze

Bombs in which used: Baka bomb.
Color: Brass.
Over-all length: 4½ inches.
Over-all width: 2¾ inches.
Material of construction: Brass except for an aluminum striker body and steel firing pin and spring.
Position and method of fixing in bonb: The fuze is screwed into the tail fuze pocket and tightened with a spanner wrench.
Components of explosive train: Incorporated in the Navy gaine.
Fuzes likely to be found with: A-3 (g), B-10 (a).
Delay times: Incorporated in the Navy gaine.
Threads: 12 threads per inch, RH, 1$\frac{15}{16}$ inches in diameter.

Description: The fuze body has at its upper end a dome-shaped cap which has a curved inner surface. The cap is pierced by a central hole through which a stud on the arming fork fits to engage a recess in the top of the striker extension. The cap is held in place by a grub screw. Two holes 180° apart are drilled longitudinally in the fuze body to accommodate an arming fork. Two holes are drilled through the body wall along the axis of one of the longitudinal holes. The upper hole appears to be for inspection purposes. The lower hole contains a spring-loaded arming detent. A screw threads into the body just below this hole and prevents the detent from flying out of the body after it has been released by the arming fork. Two air vents 180° apart pierce the lower portion of the fuze body. A groove in the bottom of the

fuze body contains a locking spring which serves to secure the fuze firmly in its pocket.

The striker assembly consists of a striker extension, striker, and a spring. The striker extension is an egg-shaped brass knob having a cylindrical lower shaft, at the end of which is machined a small ball. The striker has a wide head which is recessed in its center to take the ball of the striker extension. There is a deep annular groove in the side of the striker into which is fitted a spring-loaded arming detent held in position by the arming fork. A spring holds the striker away from the primer after the detent has been released.

Operation: When the pilot of the bomb pulls the handle of the tail fuze arming mechanism, the arming fork is withdrawn far enough to allow the spring-loaded detent to move outward, disengaging the groove in the striker. The fuze is now armed. The striker is held away from the primer by the spring. On direct impact the weight of the striker extension forces the striker down compressing the spring and hitting the primer.

If the impact is not direct, the striker extension is cammed to the side against the curved dome of the closing cap. This action forces the striker down against the spring, thereby firing the primer.

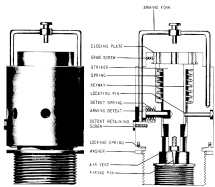


Figure 130—B-10 (a) Bomb Fuze.

B–10 (a) Tail Fuze

Bombs in which used: Baka bomb.
Color: Brass.
Over-all length: 4 3/32 inches.
Over-all width: 2 3/8 inches.

Material of construction: Brass except for the steel firing pin threaded into the lower end of the striker.

Position and method of fixing in bomb: The fuze is screwed into the tail fuze pocket and tightened with a spanner wrench.

Components of explosive train: Incorporated in the Navy gaine.

Fuzes likely to be found with: A–3(g), B–9(a).

Delay times: Incorporated in the Navy gaine.

Threads: 12 threads per inch, RH, 1 11/16 inches in diameter.

Description: The body is of one piece brass construction. It is threaded at the top to receive a brass closing plate. This plate is pierced by two spanner holes and a central hole. A grub screw holds the closing plate in place.

There are six spanner holes in the outer circumference of the fuze body, slightly below the central portion. In the same plane as the spanner holes is a locating pin, staked in place, which extends through the body and engages a keyway in the striker body. There is an arming detent 180° removed and limited in its outward movement by the head of a screw threaded into the fuze body directly below the detent cavity.

The body is pierced longitudinally by two holes 180 degrees apart, one of which terminated in the outer end of the detent cavity. A U-shaped arming fork fits in these holes and holds the spring-loaded arming detent inward so that it engages a hole in the striker body.

The heavy brass striker has a wide head which is cut by four vents. There is also a longitudinal keyway which runs the entire length of the striker and accommodates the locating pin. At a 180° interval there is a hole for the arming detent. The striker rests on a spring which is in the central channel of the fuze body. The bottom shoulder of the striker channel is pierced by four vents. A groove cut in the bottom of the fuze body contains a steel locking spring which serves to hold the fuze firmly in the fuze pocket.

Operation: After the bomb has been released from the plane the fuze is armed by the pilot of the bomb. He operates a tail fuze arming mechanism which withdraws the arming fork far enough to allow the spring-loaded arming detent to move outward, disengaging the hole in the striker. The fuze is now armed. The striker is held away from the primer by the spring. On impact the striker compresses the spring and hits the primer.

Type 99 Special Bomb Tail Fuze C–1 (a)

Bombs in which used:
  Type 97 No. 6 land.
  Type 98 No. 25 land Model 1.
Color: Steel.
Over-all length: 6 3/32 inches.
Over-all width: 2 15/32 inches.

Material of construction: Steel throughout except copper chemical tank.

Position and method of fixing in bomb: The fuze is screwed into the tail of the bomb. A steel locking ball prevents removal.

Components of explosive train: Standard Navy gaine.

Fuzes likely to be found with: None. A plug is placed in the nose fuze pocket.

Delay times: Varies from ½ to 125 hours.

Threads: 1 63/64 inches in diameter, 12 threads per inch.

Description: The fuze body is constructed in two parts—the lower body housing the firing

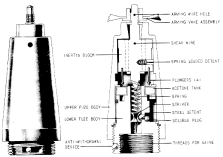


Figure 131—C-1 (a) Bomb Fuze.

components, and the upper body forming a cap extending well above the lower body and housing the arming components. In the upper body is a large inertia block having an arming spindle extending out of the fuze body. The vanes are screwed on this spindle and hold the block in position. A shear wire prevents rotation of the inertia block. On the lower surface of the block are four plungers located around a central extension which rests against a spring. This spring, when compressed by the downward movement of the inertia block, puts pressure on the striker located in the lower body. Bearing against a concave portion on the side of the striker is a steel detent held in place by a soluble plug. Also located in the lower body, and directly under the inertia block plungers is a copper tank containing acetone. A channel leads from the tank to the soluble plug.

Operation: On release from the plane, the arming wire is withdrawn and the vanes unscrew and fall free, leaving the inertia block to be held back by the shear wire which is sheared on impact. The inertia block, moving down after impact, is locked in the down position by the spring-loaded detent. At the moment that the inertia block moved down and the plungers pierced the acetone tank, the spring was compressed; the striker was then under pressure. The acetone from the tank contacts the soluble plug. When the plug dissolves, the striker moves forward under spring pressure and pierces the gaine. A steel ball locks the fuze in the pocket to prevent withdrawal.

Remarks: Anti-withdrawal. A steel ball in the threads of the fuze locks the fuze when an attempt is made to withdraw it.

Column 1 below lists delays for three models of this fuze as stated in captured documents. Column 2 lists delays obtained from actual tests.

	No. 1 (hours)	**No. 2 (hours)**
Model 1	2–12	----------
Model 2	12–72	17¼
Model 3	72–120	24½

Type 99 Special Bomb Nose Fuze C-2 (a)

Bombs in which used:

- Type 3 No. 6 land.
- Type 97 No. 6 land.
- Type 98 No. 25 land Model 1.

Color: Cadmium plated.

Over-all length: $5\frac{7}{8}$ inches.

Over-all width: $2\frac{9}{16}$ inches.

Material of construction: Steel except brass cocking piece.

Position and method of fixing in bomb: The fuze is screwed into the nose of the bomb. A steel locking ball prevents removal.

Components of explosive train: A standard Japanese Navy gaine is screwed into the base of the fuze.

Fuzes likely to be found with: C-1 (a) Navy chemical long delay tail fuze.

Delay times: Up to 125 hours.

Threads: $\frac{61}{64}$ inches in diameter, 12 threads per inch.

Description: The fuze consists of a steel body in which are housed the arming assembly and the delay assembly. The arming assembly, which is housed in the upper end of the body, consists of the arming vanes which are attached to the arming vane boss by three small screws. The arming

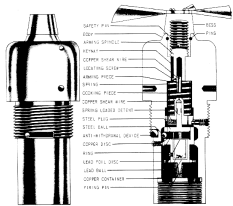


Figure 132—C-2 (a) Bomb Fuze.

vane boss is internally threaded at the lower end to receive a short, hollow arming spindle and an arming piece which is held in the base of the spindle by a copper shear wire. A small locating screw inserted in the spindle engages in the keyway of the fuze body and prevents the spindle from rotating but permits upward or downward movement. The boss is retained in the fuze body by two pins which permit it to rotate. A safety pin engages in the fuze body and the boss. The delay assembly, which is housed toward the lower end of the body, is actuated by a spring after the delay period has expired. Screwed into the top of the striker assembly is a steel plug with a cutaway striker assembly stem on which a brass cocking piece rides. In one side of this cocking piece is a small brass spring-loaded detent; on the opposite side is an assembly screw. The cocking piece and striker assembly stem are held in position by a copper shear wire. Under the steel plug is a soluble celluloid ring outside of which is a copper disc and a steel ball set into a drilled hole. This ball prevents the downward movement of the striker assembly as the ball rests on a shoulder of the fuze body. A lead foil disc is fitted over a copper container which is filled with acetone. A solid lead ball with a small copper stud on its side is placed in the container.

Operation: When the bomb is released, the safety pin is withdrawn allowing the arming vanes and boss to rotate. This action screws the arming spindle and the arming piece into the arming vane boss clear of the cocking piece. On impact, the cocking piece shears the shear wire and moves forward, compressing the striker spring. It is locked in the forward position by the detent, thus holding the striker unit under spring compression. Simultaneously, the solid ball in the acetone container breaks the lead foil disc, allowing the solvent to escape into the space above and dissolve the celluloid ring. After a period of time, in which the soluble ring has become softened, the steel ball, due to the pressure of the striker spring, is forced away from the shoulder of the fuze body. The striker assembly, under compression of the spring is forced downward and the firing pin hits the detonator.

Remarks: If dropped from a sufficient altitude, the fuze may be armed despite the presence of the safety pin. If the vanes fail to rotate, the inertia of the cocking piece may be great enough to shear the shear wire and to drive the arming piece into the provided recess in the spindle and thus permit the fuze to arm.

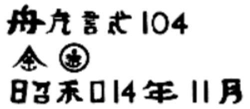
Antiwithdrawal: A steel ball in a groove in the threads of the fuze locks the fuze when an attempt is made to withdraw it.

D–2 (a), D–2 (b), and D–2 (c) Aerial Burst Tail Fuzes

Bombs in which used: No. 3 Mk 3 or No. 25 Mk 3.

Markings:

D–2 (a)—



	D–2 (a)	D–2 (b)	D–2 (c)
Color	Brass	Cadmium plated	Cadmium plated.
Over-all length	5¾ inches	5¾ inches	5¾ inches.
Over-all width	$2\frac{7}{16}$ inches	2½ inches	2½ inches.

Material of construction: Brass except for a few internal parts of steel.

Position and method of fixing in bomb: Screwed into adapter ring at apex of tail.

Components of explosive train: A primer is fitted in the fuze. The flash from it sets off a standard Japanese gaine.

Fuzes likely to be found with: Probably A–3 (a) nose fuze.

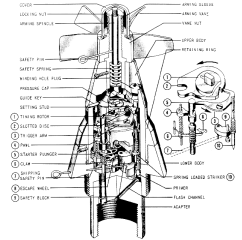


Figure 133—D–2 (a), D–2 (b), and D–2 (c) Bomb Fuzes.

	D–2 (a)	D–2 (b)	D–2 (c)
Delay times	0–50 seconds	5–20 seconds	0–20 seconds.
Threads	$1\frac{13}{16}$ inches diameter, 12 threads per inch.	$1\frac{13}{16}$ inches diameter, 12 threads per inch.	$1\frac{13}{16}$ inches diameter, 12 threads per inch.

Description: These fuzes are all similar in design, construction and operation. The clockworks in all three fuzes is almost exactly identical with the clock in a Japanese artillery projectile and with the fuze in a German artillery projectile for the 88-mm gun. All of the fuzes require a rotation of 1,000 revolutions per minute before they can function. The parts of the fuze can be

broken down into five principal categories according to their function: the body, the arming mechanism, the timing mechanism, the firing mechanism, and the safety features.

The body consists of an upper part and a lower part held together by a retaining ring which fits over the upper body and threads into the lower body. The upper body has a lip on its lower edge which is held under the retaining ring, permitting rotation of the upper body for setting the time. An adapter fits into the lower body, secured by two screws.

The arming mechanism consists of six vanes press fitted into the vane nut and an arming sleeve externally threaded to take the vane nut. The arming sleeve houses the arming spindle which is secured at the base to the pressure cap. The top end of the arming spindle is externally threaded (left-handed) to take the locking nut. A cover is secured to the vane nut with three grub screws.

The timing mechanism consists of a spring-driven clockwork which turns a timing rotor and slotted disc at a predetermined rate. The pressure cap is keyed to the upper body and has a setting stud which engages the notch in the timing rotor. The parts of the timing mechanism which start the clockwork are the spring-loaded starter plunger, the spring-loaded pawl, the claw, and the escape wheel.

The firing mechanism consists of the spring-loaded striker which has a beveled shoulder that bears against a beveled edge on the trigger arm.

The five safety features are: safety pin, safety spring, safety block which overcomes the pressure of its spring (not shown in the drawing) and swings out from under the striker by centrifugal force, shipping safety pin which locks the starter plunger, prevents the safety block from swinging out during shipping, and locks the trigger arm by the starter plunger until it rises during flight and presents a notch through which the end of the trigger arm can pass.

Operation: The fuze is set by rotating the upper body, which is calibrated up to 50 seconds, and matching the desired setting with a line on the retaining ring. The setting stud in the pressure cap—which is keyed to the upper body—is thus rotated, turning the timing rotor—in which it is engaged—and the slotted disk so that the slot of the disc is positioned with respect to the trigger arm. At the expiration of the set time, after the bomb has been dropped, the disk will have rotated so that the slot will be opposite the trigger arm.

Shipping safety pin is pulled when bomb is loaded in plane. On release, safety pin is pulled, vanes and vane nut rotate up. Initial impact of the vane nut against the locking nut, plus the continued rotation of the vanes and vane nut, lifts the pressure cap, overcoming the resistance of the safety spring and freeing the setting stud from the timing rotor. As the pressure cap is lifted, the spring-loaded starter plunger rises until the spring-loaded pawl slips into the groove in the plunger. This action of the pawl rotates the rod to which it and the claw are keyed, freeing the claw from the escape wheel and starting the clockwork. The clockwork turns the slotted disk so that the slot is rotated toward the trigger arm. The pawl locks the starter plunger up so that the notch in the plunger is opposite the end of the the trigger arm. The starter plunger no longer obstructs the end of the trigger arm, since it can now pass through the notch when the trigger is forced into the slot of the disk.

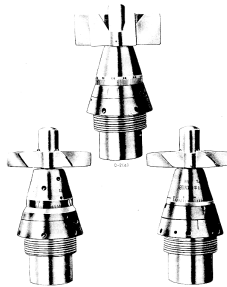
Angled fins on the bomb cause rotation which, when 1,000 revolutions per minute is attained, is sufficient to swing the safety block out from under the spring-loaded striker by centrifugal force. The spring-loaded striker is now held by the edge of the trigger arm only. After the set time has elapsed the slot in the disk comes opposite the trigger which is forced into the slot by the pressure of the beveled shoulder of the striker on the beveled edge of the trigger arm. The spring-loaded striker impinges on the primer, sending a flash through the flash channel which sets off the gaine.

Remarks: The time of delay is set before leaving the ground, and the bomb must be dropped from a specific height above the target. The bomb usually explodes about 100 to 175 feet above ground.

The fuzes D–2 (b) and D–2 (c) were not recovered from UXB's but were found in ammunition dumps.

The D–2 (c) is the earliest model of the clockwork fuzes as indicated by the early date of manufacture and the lack of an external means of winding the clock.

There may be a type 3 Mk 3 tail fuze (without centrifugal safety block) as the fuzing for a Mk 3 bomb. This fuze is used with a standard time setting of 3 seconds.



D-2(a)

D-2(b)

D-2(c)

Figure 134—D-2 (a), D-2 (b), and D-2 (c) Bomb Fuzes.

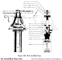


Figure 135—D-3 (a) Bomb Fuze.

D–3 (a) Aerial-Burst Nose Fuze

Bombs in which used: Type 0 Model 1, 2, and 3 parachute flares.

Color: Natural brass.

Over-all length: 4½ inches.

Over-all width: 1¾ inches.

Material of construction: Brass except for steel striker and steel locking balls.

Position and method of fixing in bomb: The fuze is located in the nose of the flare case and is secured by lock nut.

Components of explosive train: Primer flash cap and delay train incorporated in delay container.

Fuzes likely to be found with: None.

Delay times: May be varied by changing type of delay container.

Threads: 1 3/32 inches in diameter, 15 threads per inch.

Description: The upper body portion houses the arming vane assembly and the spring-loaded pin used for holding the safety wire firmly in its holes. A ball race is also present to provide smooth operating surface for the vanes (not shown). The lower body portion contains the arming sleeve into which three steel balls are fitted and which lock the striker when in the unarmed position (as shown). A primer flash cap and a powder delay comprise the explosive train.

Operation: The lock nut is tightened over the vanes which rest on the ball race. On release from the aircraft the safety wire is withdrawn from its holes, allowing the vanes to rotate, thus screwing the arming spindle downward. The arming spindle is prevented from rotating by the locating keys. The stop stud prevented the arming vane sleeve from being tightened down too far during fuze assembly. As the arming spindle moves downward, the striker and its spring move also until the striker forces the balls to move into the groove cut into the lower body (the striker is under spring pressure). As the balls move outward, the striker

moves downward, under spring action, and pierces the primer to initiate the explosive train.

Remarks: The lock nut is used for fastening the fuze securely in the body of the bomb.

This fuze has been found with three variations of arming vanes:

1. Six large flat vanes with slight pitch.
2. "French type" vanes.
3. Anemometer type vanes with six cups.

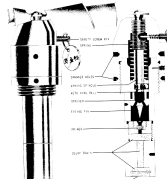


Figure 136—D–4 (a) Bomb Fuze.

Fuze For Type 0 Parachute Flare, Model 1
D–4 (a)

Bombs in which used:

Type 2 No. 6 Mk 21 Model 1 and 2 bomb containers.

Type 0 Model 1, 2, and 3 parachute flares.

Color: Natural brass or fuze with steel body may be yellow due to coat of lacquer; vanes natural steel color.

Over-all length: $4\frac{3}{4}$ inches (may vary due to type of delay container used).

Over-all width: $1\frac{13}{32}$ inches; vane span $4\frac{5}{16}$ inches.

Material of construction: Brass except for steel striker, steel retaining ball, and steel spring or fuze may be steel throughout.

Position and method of fixing in bomb: Screwed clockwise into nose and secured by lock nut. No anti-withdrawal devices used.

Components of explosive train: Primer flash cap and delay train incorporated in delay container.

Fuzes likely to be found with: None.

Delay times: May be varied by changing type of delay container.

Threads: $1\frac{3}{32}$ inches in diameter; 15 threads per inch.

Description: The fuze consists of three parts: The upper body contains the arming spindle; the lower body contains the steel striker; and the powder relay container which screws into the lower body portion. The spring loaded striker is held in position by a steel ball which rests on the shoulder in the lower body portion and is prevented from moving inward by the arming spindle. A primer flash cap is located in the lower body portion.

Operation: On release from the aircraft, the arming vanes rotate and fall clear. The arming spindle is withdrawn from the striker, allowing the locking ball to fall inward. The striker now moves forward under spring action and pierces the flash cap, setting off the powder train which eventually sets off bursting charge.

Remarks: Fuze may be constructed of either brass or steel.

This fuze is an aerial burst fuze for the Type 2 No. 6 Mk 21 container and for Type 0 Parachute Flare Model 1. When used in the Mk 21 container the D-4 (a) is designated Type 3 Initiating Mechanism and has a longer base to house a different delay train.

Type 3 Electric Firing Device

Description: The Type 3 Electric Firing Device is the product of Japanese Navy experimentation on proximity fuzing of bombs. It is operated on electronic principles, and utilizes a photoelectric cell and a self-projected beam of light to accomplish proximity detonation.

Dimensions:

Length	16 inches.
Diameter	11⅝ inches.

The fuze is enclosed in a black cylindrical sheet steel case which is domed slightly at the forward end. Three transparent glass windows are provided in the domed surface to provide for operation of the projected beam of light, for its reception by the photoelectric cell, and for checking the clockwork safety mechanism. A set of anemometer type arming vanes is mounted on the side of the fuze near its after end. Two three-pronged electrical cables are fitted near the base of the fuze, one to connect with the Type 3 electric gaine in the bomb, and the other to connect to an electrical power source in the airplane for purposes of warming up the electronic equipment before dropping. An arming wire is connected to the fuze for the purpose of throwing a gang of arming switches and for freeing the arming vanes upon dropping of the bomb. An access door, three inches square is cut into the side of the casing, and the base of the fuze is recessed and provided with bolt fittings for fixing the fuze in the bomb.

Operation: The distance above the ground at which the bomb is to explode (between 6 and 15 meters) is set by an indicator near the base of the fuze. Electrical connections to the plane's power source and the electric gaine are made. The arming wire is attached to the bomb rack. The fuze is warmed up from the plane's power source several minutes before the bomb is to be dropped. Upon release from the plane, tension on the arming wire throws switches which change the power source from the plane to the battery in the fuze and start the arming motor in the fuze. The rotation of the motor closes the main safety switch so that power is supplied to the amplifying system. The arming vanes rotate off, and allow another arming switch to close. The fuze is now completely armed, and is projecting a beam of light pulsating at a rate of 900 to 1,000 cycles per second. As the bomb nears the target, this beam of light is reflected back toward the photoelectric cell in the fuze. When the reflected light of the proper frequency reaches sufficient intensity, the photoelectric cell current, through the amplifying unit, fires the bomb.

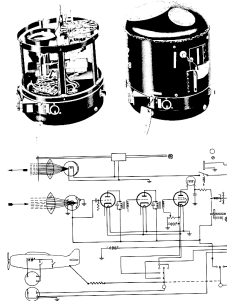


Figure 137—Type 3 Electric Firing Device.

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Chapter 2—Section 3

GAINES AND MAGAZINES

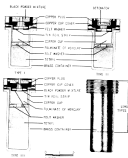


Figure 138—Army Gaines.

Introduction to Army Gaines

Japanese Army fuzes utilize a characteristic type of gaine which differs greatly from that used in Navy fuzes. All Army fuzes use one of the three types of gaines shown below or variations of a slightly different shape but of similar construction. These variations are shown in detail in the particular fuze in which they are used.

Types I and II are used in nose fuzes only, while type III is used in only the tail fuzes. Type III is approximately twice as long as types I and II. Types I and III are ignited by the flash from the primer in the fuze. Type II is used in fuzes which have no internal primer and the gaine is pierced directly by the firing pin.

All Army gaines are of brass contruction. They are screwed into the fuze and are staked in position.

Boosters are either contained in a brass cup threaded onto the fuze around the gaine, or in a paper cylinder housed in the main explosive charge of the bomb.

Introduction to Navy Gaines

The Japanese Navy fuzes utilize a characteristic gaine which incorporates within itself the entire explosive train. The gaines are similar in external appearance but vary in size and internal construction. All gaines have two wrench flats just below the threads but they are generally screwed (right hand threads) into the fuze only hand tight.

Japanese Navy gaines are generally made of brass, cadmium plated and lacquered. More recently, specimens made of steel have been recovered. The component internal parts of the gaines are: (1) Primer plugs, screwed in and staked, (2) Delay plugs, slip fit, (3) Detonator plugs, screwed in or slip fit, and (4) Booster, precast, slip fit.

The delay incorporated within the gaine is indicated by a colored tip. No standard set of figures has been arrived at regarding the times of delay. The information taken from Japanese documents does not agree with the results of laboratory tests. The figures listed on the following pages are taken from Japanese documents.

Figure 139—Introduction to Navy Gaines.

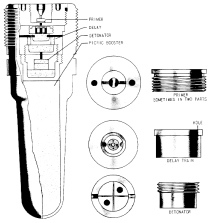


Figure 140—Type 97 Land Bomb Gaine "A" and Type 99 Ordinary Bomb Gaine "A".

Type 97 Land Bomb Gaine "A" and Type 99 Ordinary Bomb Gaine "A"

Japanese designation	Type 97 land bomb gaine "A"	Type 99 ordinary bomb gaine "A."
Delay	0.03 second	0.03 second.
Color	Green tipped	Blue tipped.

Dimensions: Over-all length 4½ inches; diameter, 1⅜ inches.

Explosive train: Primer composition in upper plug. Black powder delay over flash powder relay in middle plug. Lead azide detonator over tetryl in lower plug. Picric acid booster.

Remarks: In the type 97 land bomb gaine the primer plug is of one piece construction. In the type 99 ordinary bomb gaine it is of two piece construction. The type 97 land bomb gaine "A" Modification 1 has a 0.115-second delay.

Type 97 Land Bomb Gaine "B" and Type 99 Ordinary Bomb Gaine "C"

Japanese designation	Type 99 ordinary bomb gaine "C."	Type 97 land bomb gaine "B."
Delay	0.2 second	0.1 second.
Color	Brown tipped	Red tipped.

Dimensions: Over-all length 4½ inches; diameter 1¾ inches.

Explosive train: Primer composition in upper plug. Black powder delay over flask powder relay in middle plug. Lead azide detonator over tetryl in lower plug. Picric acid booster.

Remarks: In the type 97 land bomb gaine the primer plug is of one piece construction. In the type 99 ordinary bomb gaine it is of two-piece construction.

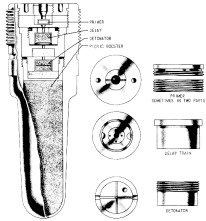


Figure 141—Type 97 Land Bomb Gaine "B" and Type 99 Ordinary Bomb Gaine "C".

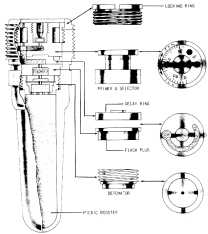


Figure 142—Type 15 Ordinary Bomb Gaine.

Type 15 Ordinary Bomb Gaine

Japanese designation: Type 15 ordinary bomb gaine.

Delay: Selective delay from fractional to 1.5-seconds.

Color: Tip not colored.

Dimensions: Length, 4½ inches; Depth, 1⅜ inches.

Explosive train: Primer composition in upper cap. Pressed black powder in semicircular channel above flask powder relay. Lead azide detonator over tetryl in lower plug. Picric acid booster.

Type 92 Land Bomb Gaine Modification 2

Japanese designation: Type 92 land bomb gaine Modification 2.
Delay: Instantaneous.
Color: Tip not colored.
Dimensions: Length 4½ inches; Depth, 1⅜ inches.
Explosive train: Mercury fulminate over tetryl in an inverted copper cup in upper plug. No delay plug present. Tetryl pellet in lower plug. Picric acid booster.

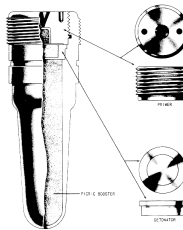


Figure 143—Type 92 Land Bomb Gaine Modification 2.

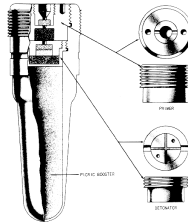


Figure 144—Type 96 Land Bomb Gaine.

Type 96 Land Bomb Gaine

Japanese designation: Type 96 land bomb gaine.
Delay: Instantaneous.
Color: Tip not colored.
Dimensions: Length, 4½ inches; Depth, 1⅜ inches.
Explosive train: Primer composition over flask powder in upper plug. No delay plug present. Lead azide detonator over tetryl in lower plug. Picric acid booster.

Type 4 Gaine for Skipping Bomb

Japanese designation: Type 4 gaine for skipping bomb.
Delay: 10 to 11 seconds.
Color: Tip not colored.
Dimensions: Length 4½ inches; Depth 1⅜ inches.
Explosive train: Primer composition in upper plug. Circular black powder delay train and relay in middle plug. Primer composition over lead azide detonator over tetryl pellet in lower plug. Picric acid booster.

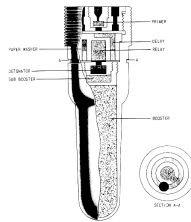


Figure 145—Type 4 Gaine for Skipping Bomb.

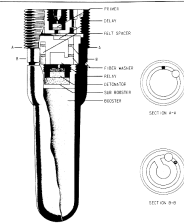


Figure 146—Type 1 Mk 2 Gaine "A".

Type 1 Mk 2 Gaine "A"

Japanese designation: Type 1 Mk 2 bomb gaine "A."

Delay: 3.5 ± 1.0 seconds.

Color: Tip not colored.

Dimensions: Length 4½ inch; depth 1⅜ inches.

Explosive train: Primer composition in upper plug. Black powder delay train pressed into upper and lower rings and relay middle plug. Primer composition over lead azide detonator over tetryl pellet in lower plug. Picric acid booster.

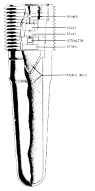


Figure 147—Type 0 Mk 5 Bomb Gaine

Type 0 Mk 5 Bomb Gaine

Japanese designation: Type 0 Mk 5 bomb gaine.
Delay: 0.2 second.
Color: Tip not colored.
Dimensions: Length 6½ inches; depth 1¾ inches.
Explosive train: Primer composition in upper plug. Black powder delay over flash powder relay in middle of plug. Lead azide detonator over tetryl pellet in lower plug. Picric acid sub-booster in cup. Picric acid booster.

Type 3 Electric Gaine

Japanese Designation: Type 3 electric gaine.
Delay: Instantaneous.
Color: Tip not colored.
Dimensions: Length, 5⅜ inches; depth, 1⅜ inches.
Explosive train: Electric blasting cap. Picric acid booster.

Remarks: The electric blasting cap fits into a specially hollowed-out cavity in the picric booster. Leads from the cap run up to a female plug which is attached by a special adapter to the standard gaine body.

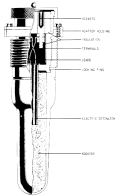


Figure 148—Type 3 Electric Gaine.

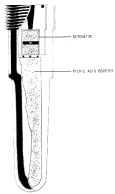


Figure 149—Type 2 Small Model Bomb Gaine Model 1

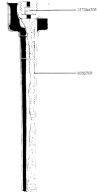


Figure 150—Practice Bomb Gaine.

Type 2 Small Model Bomb Gaine Model 1

Japanese designation: Type 2 small model. Bomb gaine Model 1.
Delay: Instantaneous.
Color: Tip not colored.
Dimensions: Length, 3 inches; depth, 13/16 inch.
Explosive train: Mercury fulminate cap over tetryl in upper plug. Picric acid booster.

Practice Bomb Gaine

Japanese designation: Practice bomb gaine.
Delay: Instantaneous.
Color: Tip not colored.
Dimensions: Over-all length, 3⅛ inches; depth, 11/16 inch.
Explosive train: Mercury fulminate in upper plug. Tetryl booster.

Navy Magazines

Japanese Navy magazines can be fitted to any fuze that takes a standard Navy gaine. Magazines are used to initiate low explosives such as black powder and are never used in a high explosive filled bomb.

There are two types of magazines. The type 98 Mk 6 bomb magazine Model 2 is instantaneous. The type 98 Mk 6 bomb magazine Model 1 incorporates a 0.03-second delay. The "a" and "b" plugs are similar to those used in standard gaines. The "d" plugs contain a large amount of gunpowder.

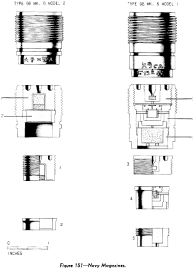


Figure 151—Navy Magazines.

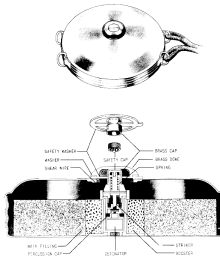


Figure 152—Type 93 Anti-Tank and Anti-Personnel Land Mine.

Chapter 3

LAND MINES, GRENADES, FIRING DEVICES, AND SABOTAGE DEVICES

Introduction

Although the use of land mines by the Japanese forces was not as extensive as it was in Europe, land mines were important defensive weapons in the Pacific war. Also, because of the Japanese lack of effective anti-tank artillery and the inequality of armored forces which was everywhere existent, mining and similar tactics became a mainstay of defense against mechanized equipment. This was more apparent as Allied forces approached the Japanese homeland, and the defense forces were better equipped than those in the outlying islands had been.

Three features of the Japanese land mining methods were especially important. The first was the relatively small number of standard, mass-produced mines and firing devices. This lack of variety in standard mines led to a large amount of field improvisation of land mines and other defense devices, using ordnance and other types of explosives originally designed and manufactured for other purposes.

The second outstanding feature of Japanese land mining was the prevalent use of extremely large charges for all types of land mines. Bombs, sea mines, depth charges, and even torpedo war heads were used extensively with all types of detonating equipment. The use of these large charges, although it was wasteful, was the result of inability to use heavy explosive ordnance for its intended purpose, and rendered the potential danger area of land mines very great.

The third was the emphasis which was placed on various types of controlled mines. This tendency was in keeping with the use of improvised mines, controlled mines being much easier to improvise than enemy activated mines. Controls ranged all the way from elaborate electrical systems to crude, hand-operated, suicide devices. Firing devices operated by simple lanyards or poles were very common.

Japanese mining techniques were characterized by an almost complete lack of uniformity. Land mining policies seemed to have been formulated by local authorities and indicated that little or no information was available, and that training was inadequate. Thus, the Japanese land-mining program was far from being as effective as it should have been tactically and did not often cause serious difficulty to advancing Allied forces.

Section 1

LAND MINES

Type 93 Antitank and Antipersonnel Land Mine

Diameter: 6¾ inches.
Over-all height: 1¾ inches.
Weight: 3 pounds.
Weight of explosive: 2 pounds.
Type of explosive: Solid ring main charge of cast picric acid with inner ring booster of pressed powdered picric acid containing a central hole ⅝ inch diameter to house fuze. Explosive completely covered by layer of paper, shellacked to the explosive and waxed externally.
Color and markings: Olive-drab with narrow red ring around brass plug. Mine may have numerals (such as 16.9) in white on top indicating date. 安 meaning safe inscribed on top of safety cap and on lug of safety washer.

Description: The mine is circular with a slightly domed top and flat bottom. It is constructed of an upper and lower section of sheet metal secured together by four heavy corrugations in the walls which serve as threads. The overlap of the walls of the two sections is sealed with a bituminous paint. The interior of the container is painted with a black enamel. Soldered on the inside of the bottom of the lower section is a brass disc $1\frac{9}{16}$ inches in diameter, having a threaded collar for the insertion of the fuze.

The central hole in the upper section is reinforced with a brass collar threaded to receive the brass plug. A thin leather washer fits between the brass plug and the collar to seal the mine.

Two brass rings are fastened to two opposite sides of the upper section by means of a soldered metal strip. Drag ropes may be fastened to the rings.

The fuze assembly consists of a striker held under spring pressure by a shear wire, a percussion cap, a primary detonator, and a larger secondary detonator all incorporated in the fuze body which is threaded on the lower end to screw into the collar in the bottom of the mine. A safety cap is screwed into the upper end of the striker until the mine is laid. An additional safety feature is a brass cylinder with attached washer which fits over the brass safety cap and rests on top of the fuze body, the washer fitting under the leather washer of the brass plug.

Employment: Antipersonnel and antitank. The Japanese have two sizes of shear wire for this mine. One for antipersonnel use shears at 70 pounds, the other, for antitank use shears at 250 pounds. These mines have been found buried upside down with additional explosives placed beneath them to increase their effect. The A/P fuze has a black upper body.

Operation: With the safety devices removed, any load on the cover of the mine causes the brass plug to press down on the striker. If the pressure is sufficient, the shear pin is sheared. This frees the striker which, under pressure of the spring, strikes the percussion cap initiating the detonating system.

Anti-Vehicular "Yardstick" Land Mine

Over-all length: 36 inches.
Diameter: 3.35 inches by 1.8 inches (oval).
Total weight: 10½ pounds.
Weight of filling: 6 pounds.
Weight of each explosive block: ¾ pound.
Type of explosive: Eight identical blocks of picric acids cast in paper container, coated with paraffin. Each block molded on one end to take fuze so that two blocks placed with molded ends together completely enclose fuze.
Color and markings: Mine case painted olive drab over undercoat of black. Interior painted with black lacquer. Designation.

信管頭部側

(fuze top portion) stenciled vertically in red characters approximately ⅞-inch tall on one side, and the corresponding marking

信管底部側

(fuze bottom portion) in smaller characters about ½-inch tall stenciled on reverse side.

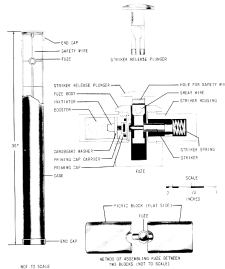


Figure 153—Anti-Vehicular "Yardstick" Land Mine.

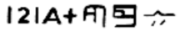
Description: The mine is an oval tube formed by two halves of sheet steel welded together with continuous welds and closed at both ends by steel caps held in place by single screws. One of the caps has a hole to take the safety wire, which is a single wire extending the length of the mine and passing through all the fuzes. A spring clip holds the safety wire in place. The explosive blocks flattened on one side do not completely fill the mine case. The space left between the flat side of the blocks and the wall of the case accommodates the protruding heads of the fuzes and also allows space for the side of the case to be depressed on the fuzes by the passage of a vehicle over the mine.

The fuze consists of a short, cylindrical body which houses the striker release plunger, the striker housing which contains the striker and striker spring, and the gaine. The gaine and striker housing are identical in external appearance and screw into the sides of the cylindrical fuze body in diametrically opposite positions. The striker release plunger is a split pin with an enlarged flat head. It is positioned in the fuze body by a copper shear wire. A second hole 90° from the shear wire hole accommodates the safety wire. The lower end of the plunger is split by a slot, the width of which is increased on the inner end.

Employment: This mine is used as an anti-vehicular mine.

Operation: After the safety wire is removed and burying plug is screwed in, the mine is buried. A vehicle passing over will crush the case and thereby apply enough pressure on the top of the fuze to break the shear wire and depress the striker release plunger. As the enlarged portion of the slot comes opposite, the spring-loaded striker moves across through the opening and into the primer cap.

Type 99 Armor-Penetration Land Mine

Over-all length: 4.75 inches (circular).
Over-all width: 1.5 inches.
Total weight: 2.5 pounds.
Weight of filling: 1.5 pounds.
Fuze delay: 8–10 seconds.
Type of explosive: Eight cast blocks, 50–50 RDX–TNT shaped to form circle. Individual blocks wrapped in wax paper.
Color and markings: Khaki. Stenciled in black on body: 

On opposite side is stencilled: 

Description: The mine resembles a canvas cloth bag, disc shaped, with a snap-fastened flap on the outer edge for inserting the eight blocks of explosive. Opposite the filling flap on the outer edge of the mine, is a metal adapter which is externally threaded to receive the fuze. Four equally spaced permanent magnets are attached by khaki webbing to the outer edge of the mine body. The mine is packed two to a wooden box complete with wooden shipping plugs in the fuze adapters. The fuzes are enclosed in tubular metal cases sealed with a paper band and tear string. For carrying on the field, the mines are packed individually in a khaki-colored cloth pouch.

The fuze contains two springs, a compression spring and a firing pin spring, the latter of which is contained in a firing pin sleeve. Four steel retaining balls fit into holes in the firing pin sleeve and notches in the firing pin, retaining the position of the firing pin. A fuze cap provides a base for the first spring and is grooved on the inside about one-third of the way up from its base. There is a safety pin which passes through the fuze body just below the base of the safety cap and between the striker and the percussion cap. The powder delay train threads into the base of the fuze body, and the detonator tube threads over the base of the delay train container.

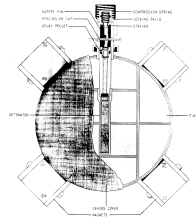


Figure 154—Type 99 Armor-Penetration Land Mine.

Employment: Used as antitank or antivehicular mine, or against armored fortifications.

Operation: The fuze is carried separately and is secured to the mine by a locking ring. In use, the safety pin is pulled, the fuze cap given a sharp rap, and the mine either placed on or tossed on armor plate within a range of ten feet. When the fuze cap is forced downward against the compression spring, its groove aligns with the retaining balls. The tension of the firing pin spring forces the retaining balls into this groove and also forces the striker down onto the percussion cap.

Remarks: Test detonations of this mine indicate a distinct "Monroe Effect" at the junction of the inner edges of the explosive blocks. One mine will produce complete perforations in plate up to 1 inch. The mines are frequently coupled together and when so used, will penetrate 1.5 inch steel plate.

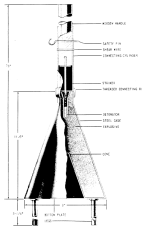


Figure 155—Lunge Mine.

Lunge Mine

Over-all length: 78 inches (including handle and legs).
Total weight: 14.3 pounds (mine body and handle).
Length of body: 11.6 inches.
Diameter at base: 8 inches.
Weight of body: 11 pounds (including explosive).
Length of handle: 59 inches.
Diameter of handle: 1¾ inches.
Weight of handle: 3.3 pounds.
Explosive filling: Crude TNT.
Weight of filling: 6.6 pounds.

Description: The mine consists of a conical shaped hollow charge, with a wooden handle at the apex of the cone and three metal legs welded to the base.

The conical charge is housed in a steel container. Fitted into the base of the charge is a hollow, truncated cone designed to give the mine

the increased power of penetration of this hollow charge. A well in the apex of the charge contains the detonator.

The wooden handle has a steel striker fitted in one end. This end is encased in a metal cylinder and is held there by a safetypin and a copper shear wire. The cylinder is attached to the neck of the charge container by a threaded connecting ring.

Three metal legs 6 inches long are welded to the base of the charge container at 120° intervals. They guarantee the proper stand-off to obtain the maximum effect from the hollow charge.

Employment: Used as an antitank weapon. Capable of penetrating 6 inches of steel plating.

Operation: The operator pulls out the safetypin, then uses bayonet tactics, the left hand at the center of the handle, the right hand at the after end, as he lunges forward. When the legs of the mine strike the target, the handle is driven forward breaking the shear wire, and the striker is driven into the detonator initiating the explosion of the mine.

Suction-Cup Mine

Over-all length: 66⅜ inches (including handle and cups).
Total weight: 7 pound 8 ounces (mine body and handle).
Length of body: $5\frac{5}{16}$ inches (including cups and handle holder).
Diameter of body: 4⅜ inches.
Weight of body: 5 pounds 8 ounces filled (including suction cups).
Total length of handle: 59⅜ inches (2 pieces).
Diameter of handle: $1\frac{7}{16}$ inches.
Explosive filling: RDX 53; percent TNT, 47 percent.
Weight of filling: 4 pounds 7½ ounces.

Description: The mine body is made of a black, sheet metal, longitudinally welded, cylinder, having a flanged metal cap spot-soldered over each end. Soldered to the circumference of the forward end, 180° apart, are two metal loops. Into each loop is fitted a solid rubber plug, the forward end of which is made into a shallow suction cup. These suction cups are held in place by metal pins and extend just forward of the leading edge of the mine body.

A wooden handle, consisting of two pieces held together by a metal sleeve, fits into a hollow extension welded to the top of the mine body.

The initiating element, consisting of pull igniters, safety fuse, prima cord and blasting caps, is rigged in duplicate and extends the length of the handle into a well in the top of the mine body. Four blasting caps are used,

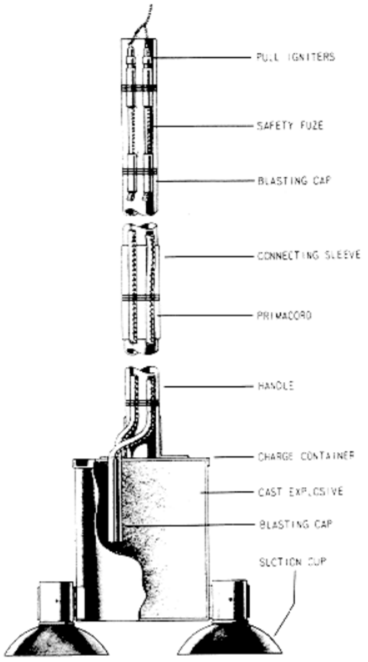
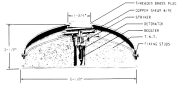


Figure 156—Suction Cup Mine.



two being crimped to forward end of the safety fuse and two being crimped to forward end of the prima cord. If only one section of the handle is used the prima cord may be omitted; in which case the blasting caps of the safety fuse are placed directly into the well of the mine. The initiating element is lashed to the handle of the mine with light line.

Employment: These mines are known to have been successfully used against parked aircraft.

Operation: The suction cups hold the mine in position when it is placed against a smooth surface. The friction igniters are pulled simultaneously, starting the safety fuse burning. This gives an estimated delay of 10–15 seconds, after which the upper blasting caps, the primacord,, the blasting caps in the charge, and the main charge are initiated in sequence.

Figure 157—Dutch Antitank and Antipersonnel Land Mine.

Dutch Antitank and Antipersonnel Land Mine

Over-all height: 3½ inches.
Height of body: 2⅞ inches.
Diameter of body: 8⅛ inches.
Diameter of cover: 8¼ inches.
Wall thickness: 5/32 inch.
Weight of filling: 5¼ pounds.
Total weight: 9½ pounds.
Type of filling: TNT.
Color and markings: Olive drab over all with "P. W. 2–41" in red across top of both cover and mine body. "P.W. 2–41" inscribed on fuze head.

Description: The body is of pressed steel construction with a crimped-on base. The cover is also pressed steel with four side slots corresponding with screw holes in the body which take the small fixing studs.

In the center of the cover is a brass plug. A helical spring holds the cover away from the body. The igniter and detonator assembly screws into the top of the body of the mine. The striker is spring-loaded and is held off the cap by the 1/16 inch diameter, soft copper shear wire. There is no safety pin.

The detonator assembly consists of a detonator tube enclosed by an outer tube, and a primer.

Employment: The Japanese use the mine mainly against personnel, laying them in narrow trails, on beaches, and at entrances to bivouac areas. Normally they lay it on top of the ground.

Operation: The movement of the cover is regulated by the size and position of the slots. Pressure on the cover is transferred from the brass plug on to the striker head, thus shearing the shear wire and allowing the spring to drive the striker into the cap thereby detonating the mine.

A load of 50 pounds is sufficient to shear the copper shear wire.

Type 3 (a) Antivehicular and Antipersonnel Land Mine

Diameter: 8.6 inches.
Height: 4.13 inches (without fuze).
Height: 6.2 inches (fuzed).
Length of fuze: 2.5 inches.
Material of mine wall: Terra cotta.
Thickness of wall: 7/16 inch.

Explosive filling: Type 88. Captured document states bursting charge might also be either ammonium nitrate, 50 percent, TNT, 50 percent; or ammonium nitrate, 90 percent; dinitronaphthalene 10 percent.

Weight of explosive: 4 pounds 8 ounces.

Total weight of mine: 11 pounds 6 ounces.

Color: Brown.

Description: The mine is circular with a slightly concave top and a moderately convex base. The mine case is made of earth-colored terra cotta. The outer surface has a thin dull glaze while the inner surface is covered with a thin coat of lacquer.

A rubber fuze seat is sealed in place in a hole in the center of the top of the mine.

The explosive filler is contained in a light rubber bag inside the mine.

The fuze body, cover, plunger, and striker support are made of bakelite. The springs, percussion hammer, striker, and the release fork are the only metal parts in the mine and with the exception of the release fork, all are contained inside the fuze.

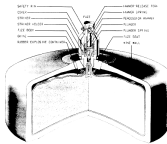


Figure 158—Type 3 (a) Antivehicular and Antipersonnel Land Mine.

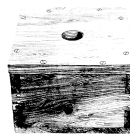
Employment: May be used as an antivehicular or antipersonnel mine.

Operation: The mine is placed in the desired location and the safety pin is withdrawn. The fuze may then be rigged to fire either by pull or pressure.

The percussion hammer located within the fuze is held in place by a release fork to which a trip wire may be attached. When the wire is pulled (22-pound pull required), the fork releases the hammer which is forced downward by the hammer spring. The hammer hits the striker forcing it through its bakelite holder into the percussion cap.

When pressure of 20–25 pounds is applied directly on the head of the fuze the plunger spring and hammer spring are compressed causing the hammer head to exert pressure on the hammer release fork. When the plunger is further depressed a groove in its inner surface comes down to the level of the hammer release fork. The pressure of the hammer head cams out the fork. The hammer is released and hits the striker which in turn pierces the detonator.

Remarks: A larger model of this mine exists, and differs from it only in size. The larger version has a diameter of approximately 10½ inches.



Type 3 (b) Antivehicular and Antipersonnel Land Mine

Width: 7⅛ inches.
Height: 5 inches (without fuze).
Height: 7.5 inches (with fuze).
Material of mine wall: Wood.
Thickness of wall: 5/16 inch.
Color: Unpainted wood.
Explosive filling: Type 88. Captured document states that the bursting charge might be either

UNDER SIDE OF COVER

MINE (COVER REMOVED)

ASSEMBLED MINE

Figure 159—Type 3 (b) Antivehicular and Antipersonnel Land Mine.

ammonium nitrate, 50 percent, TNT, 50 percent; or ammonium nitrate, 90 percent; dinitronaphthalene, 10 percent.

Weight of explosive: 4 pounds 8 ounces.

Total weight of mine: 6 pounds 4 ounces (without fuze).

Description: The mine is simply a wooden box with dovetailed sides to which top and bottom closing pieces have been fastened by screws and nails respectively.

It is a standard mine manufactured to standard specifications and employing the type 88 explosive charge and its rubber container, the threaded rubber fuze seat, and the same type fuze used in the type 3 (a) land mine.

The threaded rubber fuze seat is nailed to the bottom side of the top closing piece beneath a hole provided to allow insertion of the fuze.

Employment: May be used as either antivehicular or antipersonnel mine.

Operation: Same as type 3 (a) land mine.

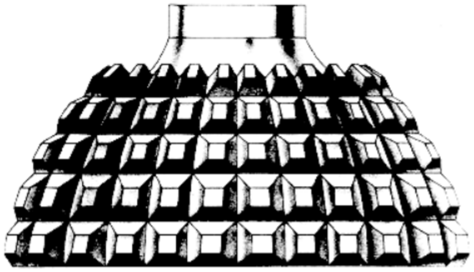


Figure 160—Beehive Antipersonnel Land Mine.

Beehive Antipersonnel Land Mine

Diameter at base: 8 inches.
Height: 4.5 inches (without fuze).
Total weight: 17 pounds (approximate).
Thickness of mine wall: ⅜ inch.
Color: Black.
Explosive filling: TNT.
Weight of explosive: 5 pounds (approximate).

Description: The mine is hemispherical in shape and its surface is uniformly serrated.

The central hole in the top of the mine is internally threaded to receive one of two fuze adapters. The first adapter takes either the plastic fuze used in the type 3 (A) ceramic and type 3 (B) wooden land mines, or the type 88 instantaneous artillery fuze from which the centrifugal detents have been removed. The second adapter is constructed to take the fuze employed in the type 93 tapemeasure mine.

Both the serrations of the mine case and the thickness of the wall (⅜ inch) indicate that this mine was to be used as an antipersonnel weapon.

Employment: Antipersonnel mine.

Operation: The operations of the type 93 land mine fuze and the type 8 (A) ceramic land mine fuze are discussed under the respective mines.

The type 88 artillery projectile fuze from which the centrifugal detents have been removed is fired by pressure on the firing pin head. Pressure on the firing pin head compresses the anticreep spring and the firing pin is forced into the primer.

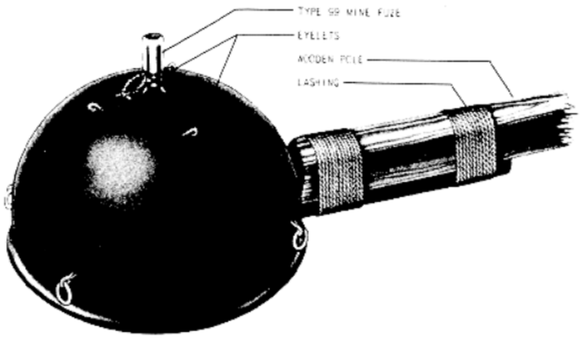


Figure 161—5-kg. Hemispherical Antitank Land Mine.

5-kg. Hemispherical Antitank Land Mine

The 5-kg. hemispherical A/TK mine is a weapon designed to help overcome the shortage of A/TK weapons and armored vehicles which the Japanese forces experienced during the war. It is a suicide weapon, intended to be placed against an armored vehicle either by hand or by means of a pole or lines.

The mine is hemispherical in shape, black in color, with the fuze mounted opposite the flat face. It is equipped with a straight projection to which a pole may be lashed, and with four eyelets to which lines may be attached.

The mine is detonated by the same fuze as that used in the type 99 magnetic A/TK mine.

No specimens of this mine were found outside of the Japanese homeland, very few of them having been produced.

Bangalore Torpedo and Igniter

Dimensions: See drawing.
Total weight of torpedo: 10 pounds.
Weight of filling: 3 pounds.
Type of filling: TNT, 36.4 percent; cyclonite, 63.6 percent.
Color and markings: Torpedo tube—brown with red band inboard of externally threaded end, white triangle near midpoint of tube, and eleven inches inboard of red band on opposite side from white triangle is 

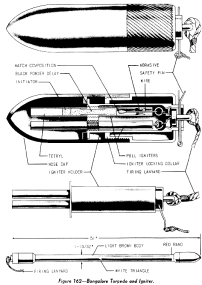


Figure 162—Bangalore Torpedo and Igniter.

Description: The igniter system consists of two pull igniters screwed into an igniter holder which fits into the igniter locking collar. The rings of the igniters are connected by lines to the lanyard holder. The igniters are simple match composition pull igniters with a black powder delay of

8 seconds, an initiant, and a base charge of tetryl. When shipping, the steel nose cap is threaded onto the igniter as shown in drawing.

The torpedo proper is a steel tube with shoulders welded to both ends. One end is internally threaded to take the igniter locking collar and the other end is threaded externally to take the pointed nose cover. When shipped the tube has a cap screwed over one end and a male plug threaded into the other.

Employment: The bangalore torpedo is used by the Japanese to demolish barbed-wire entanglements. It can also be used as a booby trap, actuated by pull.

Operation: The caps are removed from the ends of the tube, the pointed nose cover is screwed onto one end, and the igniter locking collar into the other end. The torpedo is now ready for use. When the torpedo is placed the safety pin is removed and the firing lanyard is pulled sharply. Personnel can take cover in the 8 seconds delay period.

The pulling of the firing lanyard pulls the match composition through the abrasive. The flash starts the black powder which after 8 seconds delay fires the initiant and tetryl base charge and the torpedo charge.

Pressure and Traction Land Mine

Over-all length: 12.5 inches.
Over-all width: 9.5 inches.
Over-all height: 7 inches.
Weight of filling: 2 pounds.
Type of explosive: Three blocks picric acid or TNT detonator of igniter inserted in center block.

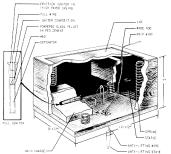


Figure 163—Pressure and Traction Land Mine.

Description: The mine consists of a wooden box, the lid of which is held in place against the internal flanges on the top by four stout springs (one in each corner). A wooden block is secured by two bolts to the underside of the lid and serves to operate the pull igniter by pressure exerted on the cover.

The explosive charge is in a separate container with the igniter and detonator inserted in the center block. A pull wire extends from the igniter over to the wire rod directly under the wooden block attached to the underside of the lid. To this wire rod are attached a trip wire which passes out through the cover to be secured to a tree or other suitable object and an antilifting wire attachment which passes through a hole in the base of the box and is secured to a peg. The igniter contains ignition composition and a pellet of powdered glass in red cement.

Employment: Used as an antitank or antipersonnel mine.

Operation: The mine will function by either of three methods: pressure exerted on the lid, tension exerted on the trip wire, or by lifting the mine to operate the antilifting device. In all instances the wire rod is moved which pulls the wire leading to the igniter.

Friction-Fuzed Land Mine

Over-all length: 13 inches.
Over-all width: 3 inches.
Over-all height: 2.37 inches.
Weight of filling: 3.5 pounds.
Type of explosive: Five blocks picric acid or TNT detonator of igniter inserted in end block.

Description: The mine consists of a wooden box, the sides of which are 0.59 inch thick. A wooden partition block inserted 4.25 inches from the unfilled end of the box serves to hold the five blocks of explosive in place and also to secure the igniter in position. To the igniter is attached a trip wire which extends out through the end of the

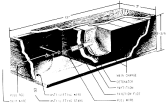


Figure 164—Friction-Fuzed Land Mine.

box and is secured to a tree or other suitable object. A safety device, the exact nature of which is unknown but reported to consist of a bottle cap, is incorporated on the outside of the box at a point of egress of the trip wire. The antilifting device consists of a wire attachment which passes through the base of the box and is secured to a peg driven in the ground.

Employment: The mine is buried 1 to 2 inches below the surface and used as either an antitank or antipersonnel mine.

Operation: The mine can function by either a tension exerted on the trip wire or by lifting the mine to operate the antilifting device. In both instances the pull igniter is fired which in turn detonates the explosive charge.

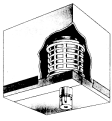


Figure 165—Improvised Land Mine.

Improvised Land Mine

Dimensions: A box 5⅝ by 4¼ by 3¼ inches.
Material: Tin.
Color: Silver.

Description: The mine consists of a rectangular box with a cover securely fastened by friction tape. Two holes are roughly punched in the cover through which a grenade fuze or detonator projects. The grenade fuze projects approximately ¾ inch, projection of detonator is unknown.

Contained in the box are one Japanese type (91) hand grenade and twelve blocks of ⅓ aluminum powder and ⅔ RDX. Each block is 1½ by ¾ inches wrapped in waxed paper. Color is black. The grenade and blocks, ⅓ aluminum powder and ⅔ RDX, are firmly held in place by waxed paper.

Employment: Can be used as an antitank mine when fuzed with the armed grenade. With a pull or tension detonator it can be used as an antipersonnel mine or booby trap.

Operation: As an antitank mine: Safety pin on fuze is removed. When it is hit by a sharp blow the striker breaks a shear wire and penetrates the primer. After a delay of 4 to 5 seconds the bursting charge explodes setting off the charge.

As an antipersonnel mine or booby trap: A pull igniter with detonator is inserted into the charge. When the trip wire is pulled, the flash will fire the detonator which in turn sets off the explosive and hand grenade.

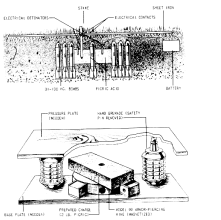


Figure 166—Improvised Antitank Land Mine and Airstrip Mine.

Air-Strip Mine (Upper Half, Figure 166)

Type of explosive: 31 100-kg. bombs and picric acid.

Method of detonation: Closing electrical circuit or by use of demolition clock.

Description: The bombs were stacked around picric acid blocks in which electrical detonators were inserted. The entire mine was under a turf-covered piece of sheet iron that would close the circuit and fire the charge if the iron were lifted or depressed. A clockwork was also inserted to fire charge if iron was not disturbed.

Antitank Mine (Lower Half, Figure 166)

Type of explosive: 2 hand grenades, a 2 pound prepared charge picric acid, and a Mod 99 armor-piercing mine.

Method of detonation: Pressure on board to fire fuzes in grenades. Sympathetic detonation relied upon for explosion of main charge.

Description: A prepared picric charge was laid on top of an armor-piercing mine and a hand grenade was set on the two sides. A board was laid over the top so that pressure would be transmitted to the fuzes of the grenades.

Type JE Antiboat Mine

Diameter: 20¼ inches.
Height: 10.62 inches.
Thickness of wall: 3/16 inch.
Material of wall: Steel.
Weight: 106.5 pounds (not including horns detonator, booster, and wiring).
Weight of filling: 46.5 pounds.
Type of filling: Type 98 explosive (HND/TNT N 40/60) with picric acid booster and tetryl detonator.

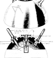


Figure 167—Type JE Antiboat Mine.

Description: This is a hemispherical, chemical-horned, all-welded mine. The outer body forms a hemisphere and has two handles on its upper portion, a central opening on top to take the booster and safety switch, and two horn openings 180° apart. The mine is divided internally into an explosive chamber and a chamber containing booster, wiring, safety switch, and horn electrodes. The division is made by a shallow, saucer-shaped steel section, which forms less than a hemisphere which is pressed into the outer body from the bottom and welded in place. A plate is then fitted into the bottom of the mine and is also welded in place. This last-mentioned plate carries a filling plug in its center and is inset $\frac{13}{16}$ of an inch to allow clearance for the plug. The horns, two in number, appear to be standard lead-acid mine horns. They are set at an angle of about 65° and project above the level of the mine top; threads are left hand. In the firing circuit is a spring-loaded plunger whose upper end projects through the safety-switch cover. A rubber diaphragm in the top of the cover insures watertightness but allows the plunger to move. There is a tapered, threaded hole in the center of the top of the plunger and a groove around the plunger near the top. Until the mine is in position a safety fork engages this groove and holds the plunger up against its spring. The inner end of the plunger is thus withdrawn from between two contacts in the electrical firing circuit and the circuit is incomplete.

Employment: Used on beaches as an antiboat mine. It can also be used on land as an antitank mine by burying or otherwise concealing it.

Operation: After the mine is laid the safety fork is removed. The contact plunger moves down under spring pressure and closes the electrical contacts, thus completing the electrical circuit and the mine is armed. When a horn is crushed an acid vial inside is broken, allowing the acid to drain down onto two plates of a small battery which generates sufficient amperage to fire the detonator. As the wiring is series-parallel, either horn on being bent will act independently to fire the mine.

Remarks: The Japanese designation is: Small type land mine.

Type JG Antiboat Mine

Method of actuation: Chemical horn.
Weight of explosive: 22 pounds.
Type of explosive: HND/TNT 40/60 (type 98).
Diameter of top opening: 5.1 inches.
Diameter of top: 7 inches.

Mine No.	Diameter of base (inches)	Height (inches)	Total weight (pounds)
1	$14\frac{5}{16}$	$10\frac{1}{4}$	57
2	$14\frac{9}{16}$	$10\frac{5}{16}$	55
3	$14\frac{9}{16}$	$10\frac{5}{16}$	62.5
4	$14\frac{5}{16}$	$10\frac{1}{4}$	57
5	$14\frac{5}{16}$	$10\frac{1}{4}$	52.5

Description: There are five modifications of the subject mine, each of them being actuated by a single chemical horn screwed into the top. The mines are either bell-shaped or of a truncated cone shape with an additional distinguishing factor being the location of the welds. The firing mechanism is similar to the J-XIII; however, a very small detonator is used to initiate the explosive train.

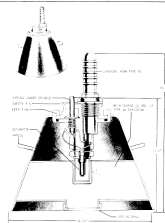


Figure 168—Type JG Antiboat Mine.

Employment: Used as an antiboat mine for the protection of beaches and reefs; also on land as A/T mine by camouflaging.

Operation: The mine is laid with the chemical horn installed and a safety pin through the spring-loaded arming spindle. When positioned properly, the safety pin is removed allowing the spindle to move down and bridge the contacts of the safety switch.

The mine is fired when the chemical horn is crushed or broken.

Remarks: The Japanese designation for this mine is: Small type mine Model 2.

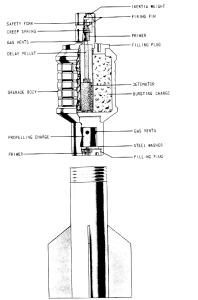


Figure 169—Type 91 Hand, Mortar, or Rifle Grenade.

Chapter 3—Section 2

HAND, RIFLE, AND MORTAR GRENADES

Introduction

The Japanese armed forces developed, both before and during the war, a fairly extensive line of hand and rifle grenades. This type of ordnance, primarily used by ground forces, was developed by the Army, but in the peculiar Japanese military organization, was also used by the Navy ground defense units.

The hand and rifle grenades used by the Japanese, although designed for a large variety of purposes, are similar in a number of respects. Generally, they are smaller than would be considered adequate by American standards. Also, observation of them in use has shown that, although explosive charges are usually large enough, effective fragmentation is often not achieved. In the main, the missiles are lacking in safety factors, and in reliability, the principles used in the igniters being of such character that they may be initiated accidentally and are subject to deterioration because of exposure to moisture. In the case of grenades of glass construction, the danger of initiation is great.

Rifle grenades are often standard hand grenades, adapted for use as rifle grenades by the addition of a tail portion. Hand grenade igniters are retained, with delay trains removed in some cases.

A large variety of improvised grenades has been found in all Pacific areas. These grenades have been adapted from such items as small ammunition, small bombs, pipe, paper, and wood. In general, improvisations were the result of shortage of the manufactured item, and were prepared by inexperienced personnel. Consequently, they were, in almost all cases, very ineffective and extremely dangerous to use.

Type 91 Hand, Mortar, or Rifle Grenade

Over-all length: 3¾ inches.
Maximum diameter: 2 inches.
Color: Body, black; fuze cover, red; and fuze, brass.
Total weight: 18.8 ounces.
Filling: Powdered TNT.
Weight of filling: 65 grams.
Delay: 6 seconds.

Description: The cast iron body is cylindrical and has 50 serrated segments. A filling plug screws into the upper end of the body, and a brass fuze screws through this plug. The base of the grenade is threaded, but not entirely through to the charge. Into these threads fits the propellant container.

The fuze consists of a brass inertia pellet with a steel firing pin separated from the primer by a creep spring. The inertia weight is held in the fuze by a light brass cap which is crimped into a cannelure in the fuze body so as to prevent the firing pin from reaching the primer. The firing pin is threaded into the inertia weight. In addition, a double brass safety pin fits through the fuze, preventing the firing pin from reaching the percussion cap.

The delay pellet screws into the base of the fuze and contains a small quantity of granular black powder and a pellet of black powder. A hole drilled in the side of the fuze contains a fusible plug which melts when the black powder burns, allowing the escape of the gases formed on combustion of the delay train. The tetryl detonator is contained in a brass tube extending from the base of the fuze to the bottom of the bursting charge.

The steel propellant container is screwed into the base of the body. A perforated plug screws into the base of this container and in a cavity in this is a percussion cap. Two flash holes lead to a small quantity of black powder. Inside the propellant container proper is a copper cup containing flakes of nitrocellulose propellant powder.

When this grenade is used as a rifle grenade, a finned tail stabilizer is screwed into the base of the grenade instead of the propellant container.

Operation: The firing pin must first be threaded down into the inertia weight. The safety pin must then be withdrawn. If the grenade is to be thrown by hand, it is necessary to strike the inertia weight on some hard object to drive the firing pin into the primer to ignite the delay train.

If the grenade is to be fired from the grenade discharger, the grenade with propellant container is dropped base first into the discharger. When the trigger mechanism of the discharger is operated, its firing pin strikes the percussion cap, igniting the propelling charge which propels the grenade. Force of setback causes the firing pin in the grenade fuze to compress the creep spring and hit the primer to ignite the delay train.

To fire the grenade from a rifle, the stabilizer is placed over the launcher and the rifle is fired using the special cartridge. The shock of discharge forces the striker into the primer igniting the delay.

Type 97 Hand Grenade

Over-all length: 4 inches.
Maximum diameter: 2 inches.
Color: Body, black; fuze cover, red; fuze, brass.
Total weight: 1 pound 3 ounces.
Filling: Powdered TNT.
Delay: 4–5 seconds.

Description: The body is cylindrical with serrations to give uniform fragmentation. This grenade is identical to the type 91 grenade except that the base of this grenade is solid and therefore cannot take a propelling charge. It can only be used as a hand grenade.

Operation: The firing pin must first be threaded down into the inertia weight. The safety pin must then be withdrawn. As the grenade is to be thrown by hand, it is necessary to strike the inertia weight on some hard object thus driving the firing pin into the primer to ignite the delay train.

Remarks: A type 97 grenade with an aluminum body has been recovered.

A gray or black grenade, which strongly resembles and appears to be a forerunner of the type 97 grenade, has also been found. This grenade employs a fuze of black powder rolled in

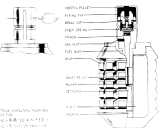


Figure 170—Type 97 Hand Grenade.

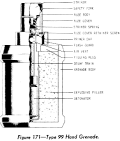


Figure 171—Type 99 Hand Grenade.

paper leading directly to the black powder bursting charge. No detonator is used in the firing train. The fuze pocket is threaded to take a mechanical fuze of the same size as the fuze used in the standard type 97 grenade.

Type 99 Hand Grenade

Over-all length: 3½ inches.
Maximum diameter: 1⅝ inches.
Color: Body, black with white label pasted around it. The top of the grenade is painted red; fuze cover, red; fuze, brass.
Total weight: 0.8 pound.
Filling: Cast picric acid.
Delay: 4–5 seconds.

Description: The cast steel body has smooth surfaces. There is a shoulder projecting 1/16 inch from each end of the body. The inside of the body is finished with lacquer to keep the filler from reacting with the steel case. The filler is also wrapped in heavy paper.

A light metal flash deflector is fitted in the top of the grenade. This deflector is ⅜ inch wide and ⅞ inch in diameter. Two ⅛-inch holes are punched in the outer periphery and match the spanner holes in the fuze body. This positions the gas vents in the fuze 90° from the holes in the flash deflector. The flash deflector reduces the possibility of the flash from the cap burning the hand of the thrower and the possibility of the flash being seen by the enemy at night.

The fuze is similar to that used in the type 91 and 97 grenades with a few improvements. On the old type the striker may turn or spring clear of the grenade when the safety wire is pulled. In this fuze, a screw in the fuze body projects through a slot in the striker cover and keeps the cover in place. The slot allows the cover to move down when the striker is struck on a hard object. Also the striker and inertia weight are machined together and the striker protrudes so that it does not have to be threaded down to arm the grenade. In other respects, the fuzes are identical.

Operation: The safetypin is withdrawn and the head of the fuze is struck on some hard object. This forces the striker down into the primer igniting the delay.

Remarks: A type 99 grenade has been encountered with a machined, waterproof, metal fuze cover. The only difference between this variation and the standard grenade is the fact that the flash guard is externally threaded to receive the waterproof fuze cover.

Type 4 Pottery Hand Grenade

Height (base to top of neck): 4 inches.
Diameter: 3 inches.
Body (Material): Terra cotta.
Thickness of case: 1/16 inch.
Color: Light brown.
Filling: Type 88 explosive.
Weight of filling: 3.5 ounces.
Total weight of grenade: 16 ounces.
Delay: 4–5 seconds.

Description: Except for the neck at the top, the grenade is spherical, consisting of two hemispheres baked together. The pottery body is light brown in color, lightly glazed inside and out. The grenade is encased in a straw-colored rubber sack which serves as waterproofing and permits the thrower to take a better grip.

The ignition system consists of a match composition, a 4 or 5 second delay element, a lead azide initiator, and a tetryl booster. All but the match composition are encased in a rubber tube which is lacquered into the neck of the grenade. The upper portion of the delay element is surrounded by a wooden collar, the top of which is covered with the match composition.

A wooden scratch block is seated on top of the neck of the grenade. It is held in place by a small rubber sack which snaps around the neck of the grenade. This sack serves a second purpose in waterproofing the ignition system.

A cloth band tied around the neck is probably used for carrying.

Operation: The small rubber sack is removed from the top and the scratch block is struck on the protruding match composition, igniting the delay element. The grenade is thrown and explodes after a 4 or 5 second delay.

Remarks: This grenade appears to be made of the same type pottery as the type 3 pottery land mine, and like the land mine, uses Type 88 explosive. For these reasons it may be assumed to be a Navy weapon.

The color of the grenade may vary from white to dark brown, and the exterior may be glazed or unglazed.

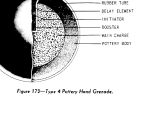


Figure 172—Type 4 Pottery Hand Grenade.

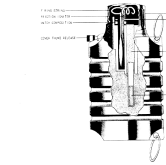


Figure 173—Type 23 Hand Grenade.

Type 23 Hand Grenade

Over-all length: 3¾ inches.
Maximum diameter: 2 inches.
Color: Black.
Total weight: 1 pound.
Filling: Granular TNT.
Weight of filling: 39.5 grams.
Delay: 5½ seconds.

Description: The body, unlike the type 91 or 97, has no longitudinal serrations, but does have five transverse depressions. On one side, fitted top and bottom, are two rings which could be used for carrying or for anchoring. The lead cover is screwed on to the top of the grenade and is grooved to provide a grip for easy removal. The thumb cover release holds the cover on and must be depressed before the cover can be removed. When this is depressed, the cover can be unscrewed in one and one-half turns, thus exposing the firing string which is attached to a friction igniter.

Operation: The thumb cover release must be depressed, and then the cover must be removed. When the firing string is pulled, it draws a sanded string through a match composition. The ignition of the match composition will ignite the black powder delay train.

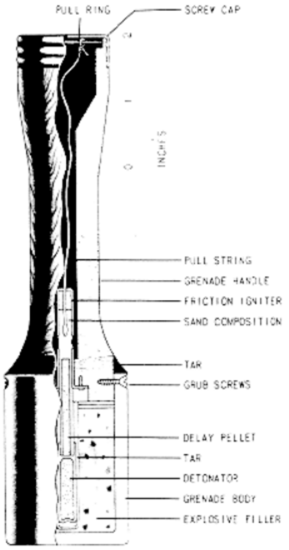


Figure 174—Type 98 Stick Grenade.

Type 98 Stick Grenade

Over-all length: 7¾ inches.
Maximum diameter: 1⁵⁄₁₆ inches.
Color: Body, black; handle, unpainted.
Total weight: 1 lb. 3 ounces.
Filling: Cast picric acid.
Weight of filling: 3 ounces.
Delay: 4–5 seconds.

Description: The body is cylindrical in shape and is made of cast steel ¼-inch thick. The handle is turned from soft wood and slips into the steel body where it is held by three screws. This joint is sealed with a coating of tar. The screw cap at the pull end of the handle is of light, tin-plated steel.

The fuze consists of a friction ignition composition with a sanded string running through it. This string extends up the hollow handle and is connected to a pull ring which is exposed by removing the screw cap at the top of the handle.

Operation: The screw cap is removed from the top of the handle. The ring inside the handle is then pulled. This draws the sanded string through the ignition composition igniting the 4 or 5 second delay. The delay train detonates a cap which detonates the main charge.

This grenade has more fragmentation effect than the German high explosive stick grenade.

Type 3 Conical Antitank Hand Grenade

	Large Grenade	**Small Grenade**
Length of grenade	6¾ inches	5⅞ inches.
Length of tail	14 inches	14 inches.
Diameter at base	4⅜ inches	4 inches.
Length of fuze	1⅞ inches	1⅞ inches.
Length of cone	3¾ inches	2⅜ inches.
Diameter of cone	2⅜ inches	2 inches.
Cone angle, apex	30°	38°.
Total weight	1.25 kg	.84 kg.
Thickness of cone	3 mm	3 mm.
Material of cone	Steel	Aluminum.

Description: This grenade is manufactured in two sizes. The basic principles of construction are the same in both sizes, but variations occur in weights, measurements and the explosive charge. The grenade consists of a cone-shaped explosive charge, a metal cone and a wooden base all contained in a silk bag. A fuze is inserted and a tail attached to the apex of the charge.

The explosive charge is cast in the form of a truncated cone. A metal cone is inserted in the base and in the upper end is a well which receives the gaine of the fuze. Surrounding the gaine is a cast ring pellet. In the large size grenade the explosive is type 94, and in the small size grenade it is Pentolite (50/50 TNT and PETN). A thin layer of waxed paper surrounds the charge.

At the bottom of the explosive charge is a wooden base which is flat on the top and rounded on the bottom. The hole in the base has a slightly smaller diameter than the hole in the cone.

Covering the charge and base is a silk bag either white or olive drab in color. When the grenade is assembled, a drawstring closes the bottom. A metal ring is inserted over the top of the bag. Inside the top of the explosive charge is fitted an adapter ring which is threaded to receive the fuze. Four screws hold the parts together.

Tied around the top of the grenade is a tail made of hemp to provide stability in flight and to make the grenade strike the tank base first.

The fuze is constructed in two parts which are threaded together. The lower body has external threads for screwing into the adapter ring and internal threads for receiving the gaine. The striker is held in position by a safety pin and creep spring. The under side of the upper body and the top of the striker are curved so that if the grenade strikes at a slight angle the striker will be cammed down.

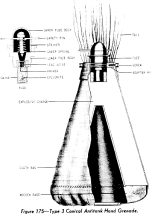


Figure 175—Type 3 Conical Antitank Hand Grenade.

Operation: Before the grenade is thrown the safety pin is pulled out. On impact the firing pin overcomes the spring and moves down to pierce the primer. The fuze is not "all-ways action", but will probably function on a slight angle of impact.

A second small grenade has been recovered which is identical to the previously described small grenade in measurements and type of construction but differs in the following details. The silk bag which covers the charge of the second grenade is made of bright yellow finished silk. The main explosive charge is picric acid with a small R. D. X. booster. The adapter ring is bakelite instead of metal, while a straw tail is used in place of hemp. The fuze of the second grenade has a black finish, a single safety pin, and a gaine which is crimped to the fuze body, but otherwise is similar in construction and operation to the fuze of the first grenade.

Sling Hand Grenade

Over-all length: $5\frac{7}{8}$ inches.
Maximum diameter: $1\frac{13}{16}$ inches.
Color: Black.

Total weight: 1 pound, 3 ounces.
Filling: TNT.

Weight of filling: 1 ounce.
Delay: 4 or 5 seconds.

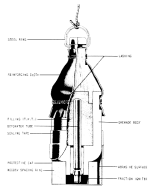


Figure 176—Sling Hand Grenade.

Description: The sling grenade consists of a steel grenade body, wooden base plug, reinforcing cloth, scratch type friction ignited fuze, wooden fuze seat, wooden spacing ring and a metal protective cap.

The rough, cast steel, cylindrical grenade body has a hollow projection on its forward end into which the wooden fuze seat and fuze are fitted and secured with glue. The after end of the body opens directly into the TNT filled explosive cavity of the grenade. This opening is closed by the wooden base plug, which is glued in place. The throwing line is attached to the after end of the wooden base plug.

A strip of reinforcing cloth is wrapped around the base plug and the after end of the grenade body in order to help prevent the two sections from pulling apart when a line is used to throw the grenade. The cloth is lashed securely in place by light line, which is tied around the annular groove in the grenade body and the cylindrical after section of the base plug.

A light, sheet metal cap is sealed over the nose of the grenade with waterproof paper tape. The wooden spacing ring prevents contact between the fuze and the protective cap. A flat surface on the side of the ring is coated with the abrasive compound used to ignite the fuze.

The fuze for the sling grenade is made in two sections: a long brass detonator tube and a short igniter head. This tube is pierced by a single gas port and is crimped to the detonator tube.

Operation: The abrasive on the spacing ring is rubbed against the match head of the fuze to ignite the match composition which initiates the firing train. The grenade is then thrown by hand or by means of the line attached to the ring in its base. The delay is from 4 to 5 seconds.

½-kg. Incendiary Hand or Mortar Grenade

Over-all length: 5.6 inches.
Maximum diameter: 2.0 inches.
Body material: Brass.
Weight: 1.1 pound.
Filling: White phosphorus.
Delay: 4 or 5 seconds.

Description: This grenade may be thrown by hand or projected with the 50 mm. grenade discharger, Model 89. The incendiary filling is contained in brass body which may have a propelling charge on the base. The fuze is identical to the one used in the types 91 and 97 fragmentation hand grenades.

The steel propellant container is 1¼ inches. long, 1.02 inches in diameter, and has six perforations in its walls. It is screwed into the base of the body. A perforated plug screws into the base of this container and in a cavity in this is a percussion cap. Two flash holes head through the percussion cap holder to a small quantity of black powder. A perforated steel disc covers the plug and inside the propellant container proper is a copper cup containing flakes of nitrocellulose propellant powder.

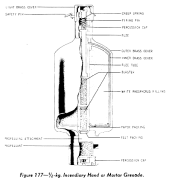


Figure 177—½-kg. Incendiary Hand or Mortar Grenade.

Operation: The firing pin must first be threaded down into the inertia weight. The safety pin must then be withdrawn. If the grenade is to be thrown by hand, it is necessary to strike the inertia weight on some hard object thus driving the firing pin into the primer to ignite the delay train.

If the grenade is to be fired from the grenade discharger, or knee mortar as it is sometimes called, the grenade with propellant container is dropped base first into the discharger. When the trigger mechanism of the discharger is operated, its firing pin strikes the percussion cap igniting the propelling charge which propels the grenade. Force of setback causes the firing pin in the grenade fuze to compress the creep spring and hit the primer to ignite the delay train.

Incendiary Stick Grenade

Over-all length: 13.2 inches.
Maximum diameter: 2.1 inches.
Length of handle: 5.3 inches.
Filling: Phosphorus, rubber pellets, and carbon disulphide.

Description: This grenade body is long and cylindrical with hemispherical ends. The handle

is solid and has a transverse hole drilled through one end. The body is filled with 41 phosphorus-impregnated rubber pellets in carbon disulphide. These pellets are scattered by means of a small central bursting charge. It is possible that the grenade is sometimes filled with a phosphorus smoke filling. The handle protrudes from one end of the body, the fuze from the other.

The fuze consists of a brass inertia pellet with a steel firing pin separated from the primer by a creep spring. The inertia weight is held into the fuze by a light brass cap which is crimped into a cannelure in the fuze body so as to prevent the firing pin from reaching the primer. The firing pin is threaded into the inertia weight, and, before arming, it is not screwed in far enough and its point does not protrude below the base of the inertia weight. Therefore, before using the grenade it is necessary to screw the firing pin into the inertia weight so that it will protrude. In addition, a double brass safety pin fits through holes in the brass cap and fuze body into holes in the inertia weight thus preventing the firing pin from reaching the percussion cap.

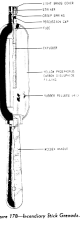


Figure 178—Incendiary Stick Grenade.

The delay pellet screws into the base of the fuze and contains a small quantity of granular black powder in the top and a highly pressed pellet of black powder in the lower section. A hole drilled in the side of the fuze contains a fusible plug which melts when the black powder burns, allowing the escape of the gases formed on combustion of the delay train. The escape of these gases will enable the thrower to know if the delay pellet has ignited.

Operation: The firing pin must first be threaded down into the inertia weight. The safety pin is then withdrawn. Just before throwing, it is necessary to strike the inertia weight on a hard object, driving the striker down into the primer and igniting the delay. The detonation of the burster tube will scatter the incendiary pellets which will ignite spontaneously.

Molotov Cocktail

Over-all length: 11¼ inches.
Maximum diameter: 2⅜ inches.
Filling: Any inflammable benzene-type liquid.
Capacity: 12 ounces.

Description: The body of this grenade consists of a Japanese beer bottle into the top of which is fitted an "all-way" action fuze. There is a rubber washer under the fuze to render it liquid tight, and the fuze fits into the neck of the bottle in the manner of a crown stopper.

The fuze consists of a firing pin contained in a housing and separated from the detonator contained in a carrier by a safety pin and a creep spring. The firing pin housing has a hemispherical weight on the top of it and bears against the underside of the nose cap which is of a similar shape. The bottom of the detonator carrier is also rounded

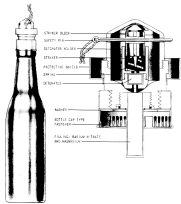


Figure 179—Molotov Cocktail.

and bears against a cam surface so that it too is free to move. The safety pin runs through the firing pin housing and rests against the top of the detonator carrier so that neither part is free to move. Beneath the detonator there is an incendiary mixture consisting of barium nitrate and magnesium.

Operation: The safety pin is pulled out and the grenade is thrown. On impact the "all-way" fuze will function and set off the detonator thus igniting the incendiary booster and inflammable filler.

Phosphorus-Ignited Molotov Cocktail

Carton: Length, 13½ inches; diameter, 3½ inches.
Bottle: Length, 9¾ inches; diameter, 2¾ inches.
Igniter capsule: Length, ⅜ inch; diameter, 2⅛ inches.

Weights:

- Grenade (complete): 2 pounds 12 ounces.
- Bottle (filled): 1 pound 10.5 ounces.
- Inflammable liquid: 9.5 ounces.
- Igniter capsule (complete): 2 ounces.
- Igniter compound (black phosphorus): 1 ounce.
- Filling: 15 percent solution of polymethylmethacrylate in benzene.

Description: The grenade consists of a 300 cc. green or clear glass bottle filled with an inflammable liquid and sealed with an ordinary crown type cap. The bottle is fitted with an adjustable rubber harness which is used to hold a flat circular glass igniter capsule to the base.

The grenade is packed in a tubular varnished cardboard carton. The igniter capsule is well protected in the container by several layers of cardboard and sawdust.

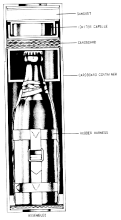


Figure 180—Phosphorus-Ignited Molotov Cocktail.

Operation: A rip cord is pulled to open the carton. The igniter capsule is secured to the base of the bottle by the rubber harness. When the grenade is thrown forcibly against a hard target it shatters and the friction between the pieces of phosphorus causes instant ignition of the inflammable material. The viscous nature of the filling prevents undue splashing and insures adherence to the target.

Figure 181—Frangible H. C. N. Grenades and Frangible Smoke Grenade.

Frangible HCN Grenades

Maximum diameter: 3.9 inches.
Total weight: 1.2 pounds.
Filling: Hydrocyanic acid.
Weight in filling: 12.2 fluid ounces.
Capacity: 14.5 fluid ounces.

Description: These grenades are recognizable mainly as round glass bowls filled with HCN. They differ in minor details.

1. The copper stabilized type is round bottomed whereas the 172 B–K and 172 C–K have flat bottoms.

2. The copper gives one a yellow tint while the other two appear to be light green.

3. The copper stabilized type has one moulded ring around the outside instead of two as the others have.

4. The copper stabilized type is closed by a crown cap over a cork stopper and the other two are closed by a crown cap over a rubber washer.

5. The copper stabilized type is carried in a sheet metal container and the 172 B–K and 172 C–K are carried in cardboard containers.

The grenades contain 12.2 oz. of liquid which is about 80% hydrocyanic acid. This is a very strong systemic poison.

Operation: The grenade is thrown and on impact the glass will break releasing the HCN. This gas is swift and deadly if inhaled. In such quantities the gas is exceptionally nonpersistent so these grenades are designed for use in small closed spaces such as pillboxes or tanks.

Frangible Smoke Grenade

Over-all length: 3.3 inches.
Maximum diameter: 2.6 inches.
Circumference: 9.3 inches.
Color: Light yellow.
Total weight: 9.7 ounces.
Filling: Titanium and silicon tetrachloride.
Weight of filling: 4.1 ounces.

Description: This grenade is a flat bottomed spherical container made of clear glass. It has a short neck closed by a red rubber stopper held under a red rubber washer within an inner iron crown cap, this being enclosed by a heavier iron outer crown cap. The filling is a mixture of titanium and silicon tetrachloride which will be hydrolyzed by the moisture of the air, with the formation of hydroxides and hydrochloric acid.

Operation: The grenade is thrown and on impact the glass bottle breaks releasing the fluid and producing smoke. It is intended for use in screening operations. Though the filler is irritating to the skin as a liquid, in ordinary field concentrations the smoke is hardly irritating enough to cause coughing.

40-mm Hollow-Charge Rifle Grenade

Over-all length: 7.98 inches.
Maximum diameter: 1.58 inches.
Color: Black and grey.
Total weight: 12.45 ounces.
Filling: 50/50 RDX and TNT.
Weight of filling: 3.81 ounces.

Description: This grenade is a copy of the German Gross Gewehr Panzergranate and is fired from a cup launcher attached to the standard 6.5 mm rifle.

The body is cylindrical with a semiconical shaped head. It is made in two parts threaded together and fitted with a ballistic cap and cone to give the hollow-charge effect. The forward part contains the explosive charge cast around the cone. The after part which is made of aluminum has a rifled collar near the base and contains the fuze and explosive train.

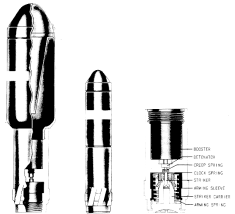


Figure 182—Hollow-Charge Rifle Grenades.

The fuze is held in by a base plate with a protruding spigot which is screwed into the base of the grenade. The fuze is held in position by the spigot. The needle firing pin is secured in a housing that has four stirrup-like springs protruding from the side. Around the housing is a setback spring held in by an arming sleeve which has two sets of grooves notched on the inner side. Holding the firing pin stationary is a coil clock spring which is held in by the arming sleeve. There is also a creep spring between the firing pin and detonator.

The propelling charge consists of a special cartridge with a wooden bullet.

Operation: On firing, setback causes the arming sleeve to move down and it is held down by the stirrup springs which engage in the groove in the arming sleeve. Centrifugal force then causes the clock spring to expand and the fuze is armed. On impact the firing pin housing overcomes the creep spring and moves onto the flash cap setting off the detonator and booster.

30-mm Hollow-Charge Rifle Grenade

Over-all length 6.25 inches.
Maximum diameter: 1.18 inches.
Color: Black and gray.
Total weight: 8.25 ounces.
Filling: 50/50 RDX and TNT.
Weight of filling: 1.75 ounces.

Description: The explosive head of the 30-mm grenade is of the same type construction as that of the 40-mm, but on a smaller scale. The spigots of the 30- and 40-mm grenades are identical with the exception of the threads on their forward ends. Both grenades use the same fuze.

Operation: The operation of the 30-mm hollow-charge rifle grenade is identical to that of the 40-mm size.

Model 3 Modification 1 Rifle Grenade

Over-all length: 8 inches.
Maximum diameter: 1⅝ inches.
Thickness of body wall: ⅛ inch.
Length of body: 2 13/16 inches.
Length of tail: 4 5/16 inches.
Length of fuze: 1 3/16 inches.
Color: Black.
Filling (main charge): TNT.
Weight of filling: 3 ounces.

Description: This grenade is similar to the type 99 Kiska grenade with a tail assembly added. It is designed to be fired from the spigot type rifle grenade launcher. The body and tail are painted black.

The grenade body is a smooth-surfaced, cylindrical cast steel tube. It is threaded internally at the forward end to receive the cover plate. There is a bored opening in the base of the grenade body. A cylindrical solid steel plug, threaded on its after end to receive the tail assembly, is pressed into this hole.

The tail assembly consists of a stabilizer tube to which four fins are welded. The tube is constructed of rolled sheet steel with a smooth weld down the joining seam. Threads are pressed into the forward end to correspond with those on the base plug. The four fins are of light metal. The outer end of each fin is doubled back to provide a smooth exposed surface. The inner edge is bent 90 degrees and provides a surface for spot welding the fin to the tube. The fins are positioned at 90-degree intervals around the circumference of the tube.

The fuze body differs from the Type 91 and 97 hand grenade fuzes only in having an aluminum striker block into which is screwed a steel striker. A brass shear wire through the block holds the striker away from the percussion cap.

The explosive train of the grenade consists of a percussion cap, black powder relay, cyclonite primer, tetryl booster and a main charge of cast TNT. The cyclonite is enclosed in a brass container, the tetryl in a cardboard cylinder. Directly under the tetryl booster there is a set-back buffer consisting of a felt washer and a jelly-like pellet.

Operation: Prior to firing the grenade from the rifle the safety fork is withdrawn. The fuze is fully armed. On impact the brass wire through the striker block is sheared and the steel striker is driven into the percussion cap. The resultant flash ignites the black powder relay.

The fuze is instantaneous and cannot be substituted as a fuze for hand grenades.

Remarks: A translation of the labels attached to the stabilizer tube gives the following information: "This grenade can be used on rifles type 38 and type 99. The wooden bullet for type 38 and type 99 is to be used." These two rifles are the standard combat weapons for Japanese troops.

A translation of the tag attached to the safety fork gives the following precautionary measures: "Do not remove fork until ready to fire." and "Do not drop or otherwise strike on the nose."

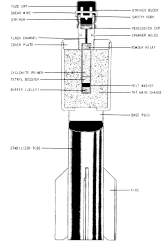


Figure 183—Model 3 Modification 1 Rifle Grenade.

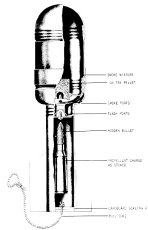


Figure 184—Smoke Rifle Grenade.

Smoke Rifle Grenade

Over-all length: 8½ inches.
Maximum diameter: Body, 2 inches; fins, 2 5/16 inches.
Color: Silver.
Total weight: 1.29 pounds.
Filling: Hexachlorethane, 56.2 percent; zinc, metallic, 27.6 percent; zinc chloride, 2.9 percent; zinc oxide, 13.4 percent.

Description: This grenade is used with a special adapter which fits over the end of the rifle barrel. It is painted silver and thoroughly waterproofed with coats of heavy lacquer and paraffin.

The nose is of No. 23 gage B. and X. tin plate with rolled threads to fit those on the body of the grenade. Soft iron wire is wrapped in the thread groove and soldered in place, presumably to aid in sealing the joint. The body proper is rolled from No. 23 gage B. and X. tin plate and is soldered along one longitudinal seam. Rolled threads are provided at each end to fit the threads on the nose and base.

The base is stamped from No. 18 gage B. and S. sheet steel and is screwed onto the body by means of rolled threads. Soft iron wire is wrapped and soldered into these thread grooves. The base is partially filled with plastic which has a threaded hole half filled with solder. The bottom plate is held in place by a small screw imbedded in the solder. The igniter pellet is encased in a thin walled brass container which is supported by tin plate screwed and soldered onto the body.

The four smoke ports are placed at 90° intervals around the base and are covered with light sheet metal discs which are held in place by waterproof cement covered with paraffin. There are three flash ports, spaced at 120° intervals, in the bottom of the base.

The grenade tube is made of No. 18 gage B. and S. seamless steel tubing and the upper end is threaded to fit the small end of the base. The threaded joint is wrapped with adhesive tape. The tube is sealed with a paraffin impregnated cardboard disc attached to 9 inches of heavy twine. The four fins are soldered to, and are equally spaced around, the tube and are of No. 24 B. and X. tin plate.

The motive force and primary ignition are furnished by a standard .256 caliber Japanese rifle cartridge loaded with 1.927 grams of powder and fitted with a wood pellet. This cartridge is wrapped in paper and stored in the grenade tube.

Operation: The rifle cartridge is removed from the grenade tube and inserted in the rifle. The grenade is placed over the spigot adapter. When the rifle is fired, the gases from the cartridge propel the grenade and also pass through the flash ports to initiate the igniter pellet which in turn ignites the smoke mixture. Smoke is then emitted through the emission holes.

Small Incendiary Rifle Grenade

Over-all length: 10 inches.
Maximum diameter: 1⅞ inches.
Color: Gray with purple body band.
Total weight: 1.01 pounds.
Filling: White phosphorus.
Weight of filling: 42 pounds.
Delay 4–5 seconds.

Description: This grenade is designed to be launched from a spigot type rifle grenade launcher on the type 38 or type 99 Japanese rifle, using a cartridge having a wooden bullet.

The grenade is of light, seamless, steel construction and has an incendiary filling of white phosphorus. The nose piece is threaded at its forward end to receive the fuze. A thin, metal well extends into the filler and is soldered around the fuze pocket to give an air tight seal. This well contains the detonator and auxiliary detonator of the fuze, which serve as the bursting charge for the grenade.

The barrel of the grenade is threaded at its forward end to take the nose piece, and at its after end to receive the hemispherical end plate internally and the base piece externally. The end plate has a small hole in its center. The base piece is threaded at one end to screw onto the barrel and at the other end to screw into the stabilizer tube. A bakelite cushion is cast into the base piece to fit the hemispherical end plate.

The stabilizer consists of a cylindrical tube which threads onto the base piece. Four fins are welded to the after section of this tube at 90° intervals.

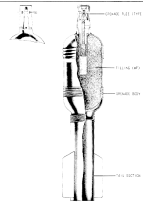


Figure 185—Small Incendiary Rifle Grenade.

The rolled threads, joining the barrel and base piece and base piece and stabilizer, are reinforced by wrapping and soldering soft iron wire into the thread grooves.

The fuze used in this grenade is the same as that used in the type 97 hand grenade.

Operation: After the grenade has been placed over the spigot adapter of a rifle loaded with a cartridge having a wooden bullet, the safety pin is removed from the grenade. When the rifle is fired, the gases from the cartridge propel the grenade, and the force of setback initiates the grenade fuze. After a short delay, the fuze detonates, rupturing the case of the grenade.

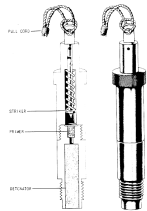


Figure 186—Mechanical Pull Igniter.

Chapter 3—Section 3

FIRING DEVICES AND SABOTAGE DEVICES

Introduction

Japanese demolition equipment is similar in appearance, construction, and function, to that used by the Allies, and can be considered completely adequate for its intended use. The devices covered in this section are standard types and were in widespread use throughout the war.

Several long delay demolition devices were devised by both the Japanese Army and Navy, but were used only in very rare instances. These devices employed chemical delays and mechanical clockwork delays. They were of sound design and construction. Had these devices been mass produced, they could have been put to very good use by the retreating Japanese forces.

Some representative sabotage devices and materials are discussed in this section as illustrations of the types of materials used by the Japanese for this purpose.

As in the case of land mines, the Japanese did a great deal of improvising with demolition material in order that it might be put to special uses. Consequently, a very great variety of combinations and uses of materials was found. In general, Japanese materials of this type were good, but their employment was often faulty and inefficient.

Mechanical Pull Igniter

Over-all length: $3\frac{1}{16}$ inches.
Maximum diameter: $\frac{17}{32}$ inch.
Color: Dark gray.
Material of construction: Steel.

Description: The igniter body is made in two sections. The forward section, which contains the primer cap and a black powder relay, threads into the after section and is staked in place.

The after section houses the firing assembly whose components are a two-piece striker, striker spring, safetypin, and lanyard. The juncture of the two striker sections is effected by a notched joint. The striker spring bears against the igniter body and the striker flange. The safety pin is inserted through holes in the igniter body and the after section of the striker to which the lanyard is attached.

Employment: Not known. Could be used as a pull firing device for booby traps.

Operation: Before firing, remove the safety pin. A pull on the lanyard draws the striker to the rear compressing the striker spring. When the notched joint of the striker is drawn past the end of the igniter body, the forward section of the striker is disengaged and driven forward by the compressed striker spring. The striker impinges upon the primer cap which ignites the black powder relay.

To render safe: Insert safety pin and cut trip wire if present.

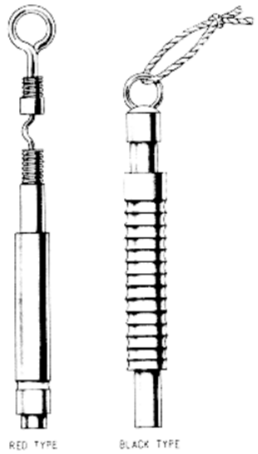


Figure 187—Friction Pull Igniters.

Friction Pull Igniters

	Red type (Inches)	Black type (Inches)
Igniter length	2 3/4	3 1/16
Igniter diameter	5/16	5/16
Sleeve length	1 13/32	1 29/32
Sleeve diameter	7/16	7/16

Construction: Red Type: This igniter is composed of a brass body with a red plastic outer sleeve. At one end a screw cap is fitted with an eye for attaching a pull or trip cord. Attached to the inside of this cover is a short pull string which projects through a small pellet of friction ignition composition. The end of the igniter into which a safety fuze is crimped is covered with a piece of tinfoil to keep out moisture. The ignition pellet is contained in a brass tube crimped into the brass outer case.

Black Type: This igniter differs only slightly from the red igniter. The brass case is slightly longer and the black plastic sleeve slightly larger. The sleeve over the case has fourteen depressions or rings around it to give the hand a firm grip. The red igniter has only one ring. As in the red igniters, the ignition pellet is contained in a brass tube crimped into the brass outer case. Tied through the eye on the cap is a heavy cotton cord to assist in pulling. The cap is not threaded but slides off.

Employment: These igniters are designed to ignite safety fuze but can be used with a detonator to ignite trip wire booby traps.

Operation: When the sanded end of the pull string is drawn through the igniter composition, it ignites and flashes through the igniter body.

Waterproof Safety-Fuze Igniter

Igniter length: 4½ inch.
Igniter diameter: ⅜ inch.

Description: This igniter has a brass case with a percussion cap and a nipple to which safety fuze or a nonelectric blasting cap can be attached

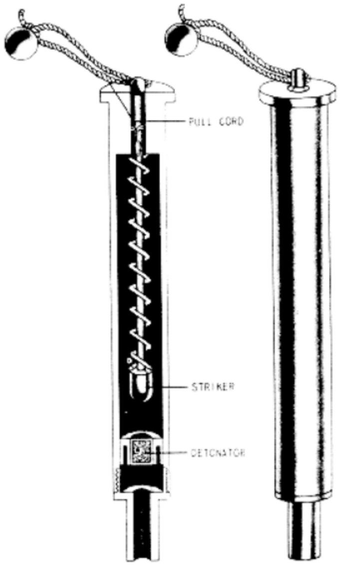


Figure 188—Waterproof Safety-Fuse Igniter.

at one end, and a small hole at the opposite end through which the knobbed head of the release pin protrudes. The firing assembly consists of a release pin and striker connected by a notched joint and surrounded by the firing spring. This igniter has no safety pin, but depends for its safety factor upon the fact that the firing spring is not compressed until a pull is exerted on the release pin.

Employment: This igniter is used in smoke signal bombs and as an igniter for booby traps.

Operation: A pull on the cord attached to the release pin draws the release pin and a portion of the striker through the release-pin hole, compressing the striker spring. The release pin is disengaged from the striker when the notched joint connecting the two parts clears the release pin hole. The striker is then driven forward by the compressed striker spring and impinges on the primer cap.

Trigger-Type Safety-Fuse Igniter

Description: The igniter consists of the housing, firing assembly, and sear lever. The housing is a brass body into one end of which is screwed and soldered a steel base having a bayonet joint for locking a primer cap and fuze to the assembly. The opposite end of the body is internally threaded to take the hollow closing plug. This closing plug fits over and secures the knurled safety ring and a spring washer which prevents the safety ring from slipping. The safety ring has an internal and external cut-away section. The internal section engages a grub screw on the closing plug, and so limits the distance through which the safety ring can be turned. The external section is beneath the trigger of the sear when it is properly positioned for cocking or firing.

The firing assembly consists of a striker and striker spring within the housing, and a lanyard eye which is threaded onto the after end of the striker. A lanyard is attached to the lanyard eye.

The sear lever is a steel bar which is pivoted on a double supporting lug attached to the igniter body. One end of the lever bears the sear which passes through a rectangular hole in the igniter body to engage the striker flange when the striker is retracted. The opposite end of the lever is flattened to form a trigger. A spring-loaded plunger is set into a round hole in the body and closing plug. This plunger bears against the trigger keeping the sear depressed. The plunger and spring also lock the closing plug and the body together.

Employment: This device is used to ignite safety fuse and could possibly be used as a pressure igniter for booby traps.

Operation: To cock the device, rotate the safety ring until the external cut-away portion is opposite the trigger. A pull on the lanyard will then retract the striker and striker spring. The sear rides over the flange on the striker and is forced to drop in front of the flange by the plunger and spring. The sear then holds the striker and spring in the cocked position. By rotating the safety ring so that its solid portion is beneath the trigger, the firing device is on "Safe" and the trigger cannot be depressed. The device is connected to the primer cap and fuze by means of the bayonet joint in the base.

To fire the device, turn the safety ring so that the cut-away section is beneath the trigger. Depressing the trigger disengages the sear from the striker flange allowing the cocked striker to move forward and impinge upon the primer.

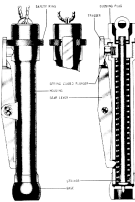


Figure 189—Trigger-Type Safety Fuse Igniter.

To render safe: Turn the safety ring to the "Safe" position and detach the primer and fuze from the bayonet joint in the base of the igniter. Very little pressure is required to depress the trigger.

Booby-Trap Firing Device

Over-all length: 5¾ inches.
Diameter: 1½ inches.
Weight: 2 pounds 6 ounces.
Color: Black.
Material of construction: Cast iron.

Description: The body is turned out of a solid 1½-inch, cast-iron bar. It houses a spring-loaded striker which is held in position by a safety pin and a release pin. The safety pin fits through the

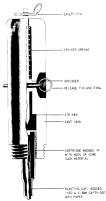


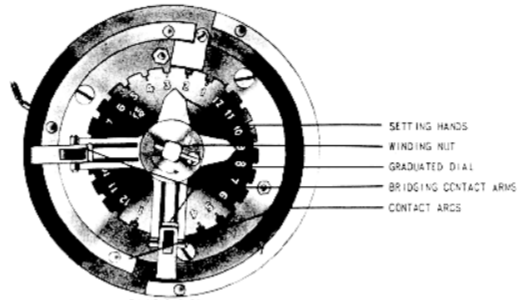
Figure 190—Booby-Trap Firing Device.

aft end of the striker projecting out of the upper part of the body. The release pin extends through the body and the shoulder of the striker. The explosive train consists of a 6.5-mm cartridge case into which is wedged a blasting cap with the open end facing the cartridge cap. The cartridge case is wedged into the base of the firing device.

Employment: The threaded base fits the fuze cavity of a 20-pound British bomb. This device is very easily adapted for booby traps.

Operation: Device screwed into bomb, pull wire attached to release pin, and safety pin removed. Pull on the wire removes release pin which frees the striker.

To render safe: If the release pin is still in position with a trip wire attached, insert a pin through the safety pin hole, cut the trip wire and unscrew the device from the bomb.



24 HOUR CLOCK

TYPE 99 LONG DELAY CLOCK

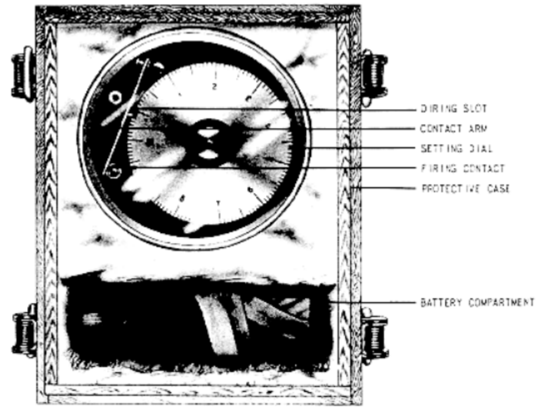


Figure 191—Demolition Clocks.

Twenty-Four-Hour Demolition Clock

This clock will fire a charge electrically after a delay of up to 24 hours. It has two bridging contact arms which ride on two semicircular electrical contacts connected by leads through a battery to the charge. The relation of the two arms to each other governs the amount of delay. They may be set only in one hour increments.

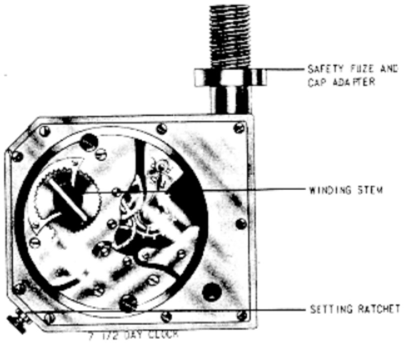
No outer protective case for the working parts of the clock is provided.

Type 99 Long-Delay Demolition Clock

This clock is electrically wound and fires its charge electrically. It has a maximum delay time of 10½ days, and winds itself every 4¾ minutes. Setting is accomplished by rotating the graduated dial to the desired delay time. At completion of the delay time, a spring-loaded contact arm drops into an aperture on the outer rim of the dial, and closes the firing circuit.

Additional gear trains and setting dials may be provided in some cases to extend delay time to 30 or 60 days.

Power for the operation of the clock and firing of the charge is provided by a battery contained in the clock's wooden protective case.



7 1/2 DAY CLOCK

TYPE 92 7 DAY CLOCK

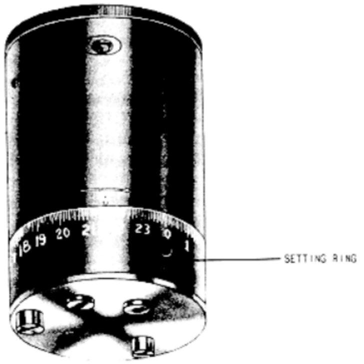


Figure 192—Demolition Clocks.

Seven-and-One-Half-Day Demolition Clock

Apparently of European design, this clock is smaller and more finely made than any of the others. It is hand wound by means of an attached key, and is set by means of a ratchet bearing against the outer edge of the dial. The dial is graduated in one hour intervals to 7½ days. The clock fires when a trigger arm falls into an aperture on the circumference of the dial, releasing the spring-loaded striker. The striker aperture is threaded on the inside to take a blasting cap, and on the outside to take a demolition block.

Type 92 Seven-Day Demolition Clock

This is a spring-driven clock with settings up to 7 days. It is capable of firing a charge either electrically or mechanically. Electric leads connect the contacts on the clock through a battery to the charge. At the base of the clock is a receptacle for safety fuze which is used if the clock is to fire its charge mechanically. A graduated ring is provided at the base of the clock for the purpose of setting delay time.

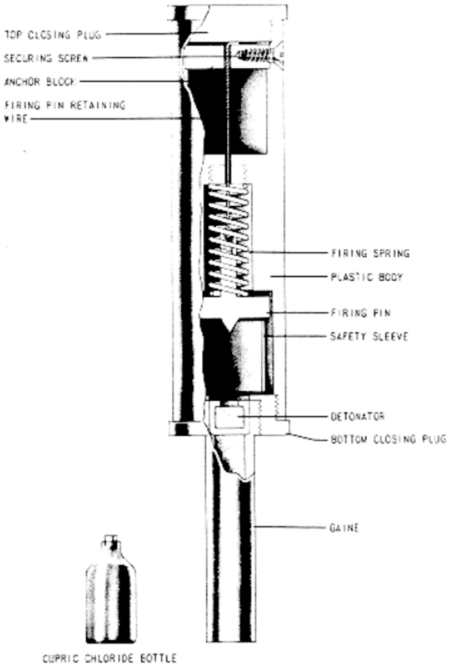


Figure 193—Time Firing Device Mk 1.

Time Firing Device Mk 1

Length (without gaine): 3¾ inches.
Maximum diameter: 1 inch.
Length of gaine: 2⅛ inches.
Diameter of gaine: ⅜ inch.
Color: Brown or transparent.
Material of construction: Plastic.

Description: Two variations of this device have been found that differ only in the color of their plastic cases and the diameter of their firing pin retaining wire. One model has a brown, opaque, plastic body and a retaining wire 0.035 inch in diameter, while the other has a transparent plastic body and a retaining wire 0.042 inch in diameter.

The body of the device is internally partitioned into three sections, and is closed at each end by a threaded plastic closing plug. The upper section, a chemical tank, is empty except for a small anchor block to which the firing pin retaining wire is secured. A small screw holds the anchor block in position. A compressed firing

spring is contained in the center section and continues into the lower section where it is seated against the firing pin. The firing pin is held in position by the firing pin retaining wire. A gum-like substance which covers the top of the firing pin spring seals the upper section against possible leakage of the chemical that activates the device. The only safety device used is a light metal sleeve inserted in the lower section between the firing pin and the detonator. The gaine is threaded into the bottom closing plug.

A small bottle of the activating chemical, cupric chloride, is carried in a separate cardboard container.

Employment: Not known. Recovery of a hand auger of approximately the same diameter as the gaine with the device strongly suggests that it can be used in preparing wells in almost any explosive charge to receive the device.

Operation: Remove the safety sleeve and replace the bottom closing plug. Pour the cupric chloride into the top of the device and replace the top closing plug. The resulting chemical reaction between the cupric chloride and the firing pin retaining wire weakens the wire, which finally snaps allowing the spring-loaded firing pin to impinge upon the detonator.

Firing tests conducted with the transparent firing devices using varying amounts of chemical gave the following results:

Tank one-fourth full	63 minutes.
Tank one-half full	Tank leaked.
Tank three-fourths full	53 minutes.
Tank full	45 minutes.

Corresponding tests with the brown device should give a shorter delay due to the smaller sized firing pin retaining wire which it uses.

To render safe: Destroy in situ if possible or remove the device from the charge and dispose of it immediately.

Chemical Delay Firing Device

Over-all length: 10 inches.
Maximum diameter: 2.5 inches.
Color: Black.
Material of construction: Bakelite.
Length of black powder delay: 6 seconds.

Description: The internal design of this device closely resembles that of the Japanese Navy C–1 (a) tail fuze. The bakelite outer casing houses the mechanical parts of the internal assembly. This internal assembly can be divided into three primary sections. The top section is the plunger, which has a locking detent in its side and is fitted on the bottom with two spikes for piercing the solvent tank. A safety fork, which is inserted through the outer casing and the plunger, prevents accidental depression of the plunger and the consequent starting of the delay action.

The central section contains the solvent tank, striker spring, striker, striker detent, and soluble plug. The upper end of the striker spring bears against a stud on the plunger while the lower end bears against the striker. The striker is held in the unfired position by the striker detent which is in turn held in contact with the grooved striker body by a soluble plug.

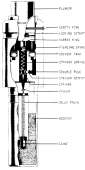


Figure 194—Chemical Delay Firing Device.

The lower section houses the firing train whose components are a primer, a pressed black powder delay train, a gaine from a 25-mm projectile fuze, and a tetryl booster.

The delay time of this device is not known as the solvent ampoule was not recovered. The purpose of the black powder delay train is also not definitely known.

Employment: Not known.

Operation: To fire, remove the safety fork and depress the plunger. This action causes the spikes on the plunger to pierce the solvent tank and release the solvent. The depression of the plunger also compresses the striker spring. The plunger is locked in the depressed position by the detent in its side which engages a notch in the outer casing. The solvent softens the soluble plug allowing the striker detent to be cammed outward to free the striker. The compressed striker spring forces the striker into the primer initiating the firing train.

To render safe: Destroy in situ if possible, otherwise remove device from charge and dispose of it immediately.

Explosive Toothpaste Tube

Length: 6.87 inches.
Width: 2 inches (approximately).
Explosive: RDX, 80.2 percent; mineral oil and wax, 19.8 percent.
Weight of explosive: 4.23 ounces.

Description: The "Tube of Toothpaste" is an unpainted, tin tube which contains an explosive filling and takes a separately packed ignition device. The tube is closed by a screwed cap.

The ignition device consists primarily of a brass plug which contains a match composition, a brass tube housing the black powder delay train, and a brass detonator tube filled with mercury fulminate over tetryl. The brass plug is threaded externally to receive a safety cap, and internally at the opposite end to take the delay tube. The detonator is crimped into the delay tube.

Operation: Remove the screw cap from the tube, insert the igniting device, remove the safety cap, and strike the match composition against a rough surface.

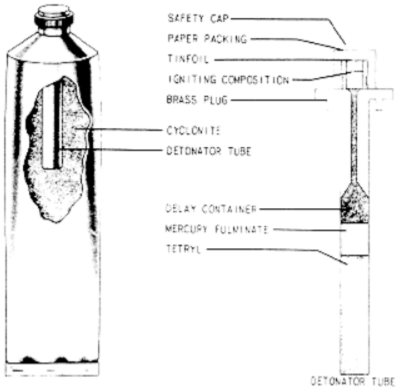


Figure 195—Explosive Toothpaste Tube.

Figure 196—Explosive Coal.

Explosive Coal

Length: 3 inches (approximately).
Width: 2 inches (approximately).
Color: Black.
Explosive: RDX.

Description: These devices consist of thin earthenware containers of irregular sizes and shapes coated with a bitumin type of paint to give them the appearance of anthracite coal. Each container is filled with explosive and contains an igniter. The igniter is a copper tube with a detonator at one end and a small black powder charge at the other end placed next to the container wall.

Close examination of a single piece of explosive coal will allow identification, but it is virtually impossible to detect when mixed with real coal.

Operation: When exposed to fire, the heat eventually ignites the black powder which in turn sets off the detonator and main charge.

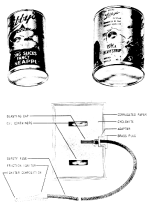


Figure 197—Explosive Food Cans.

Explosive Food Cans

Length: 4½ inches.
Diameter: 3⅝ inches.
Explosive: RDX, 78.3 percent; mineral oil, 21.7 percent.
Weight of explosive: 1.37 pounds.

Description: Three types of explosive food cans have been recovered, whose main difference lies in the spurious food labels which conceal the true nature of the can. The "tin of strawberries" is typical and consists of a standard No. 2 can filled with high explosive. The tin bears a cleverly counterfeited "Libby's Strawberries" label, which covers and conceals the threaded igniter pocket in the side of the can. This label gives the weight of the can as 1 pound 4 ounces. The interior of the can is lined with thick brown paper. Two rectangular metal containers filled with heavy mineral oil are placed in the main filling on either side of the igniter pocket.

Two smaller 14-ounce cans labeled "Libby's Long Slices Fancy Pineapple" and "Del Monte

Mixed Salad Vegetables," which are similar to the "Strawberry" can in all respects except size and label, have been recovered.

All the types of charges can be used either as sabotage devices or booby traps depending on the type of initiating system used. One common initiator has a scratch type igniter, a safety fuse delay (about 1 minute), and a detonator. Another consists of a brass sleeve containing a scratch type igniter, an integral short delay train, and a detonator. The third type of igniter consists of a brass sleeve containing a friction pull igniter, and a detonator. This last igniter has no delay and can be used only if the charge is placed as a booby trap.

Operation: The label of the can is removed or perforated to expose the igniter pocket into which the igniter is threaded. The activation of the igniter sets off the delay, if present, which fires the detonator and the main charge.

Metal Incendiary Cylinders

Length: 6¾ inches.
Diameter: 2¾ inches.
Incendiary mixture: Thermite.

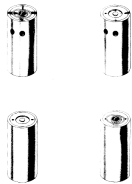


Figure 198—Metal Incendiary Cylinders.

Description: These cylinders are constructed of a light unidentified metal. They are filled with thermite and have an igniter located in the center of the top section.

Four types of cylinders have been recovered which differ as to type of casings and igniters. One casing is a plain cylinder, while the other type has vents around the top to allow more rapid escape of the thermite. Both casings can be fitted with either a friction pull igniter or a scratch type igniter.

Both igniters are of conventional design and both employ a delay element and a 5-gram first fire charge of antimony sulphide, aluminum, and potassium chlorate. A circular piece of wood with rough sides is provided as a scratch block for the scratch type igniter. The block is wrapped in waxed paper and taped to the top of the cylinders in which it is used.

Operation: Place the charge and initiate the igniter. After the delay time has expired, the first fire charge and then the main incendiary charge are ignited in turn.

Figure 199—Incendiary Brick.

Incendiary Brick

Size: Same as standard building brick.
Incendiary mixture: Potassium chlorate, sulphur, ground coal or sugar, iron filings and wax.

Description: This device is a skillful imitation of a standard, glazed building brick to which it is comparable in size, weight, and appearance. The brick is wax coated with paint to give it a realistic finish and so allow it to be carried about without detection. There is no pocket for insertion of an igniter.

Operation: The incendiary brick is ignited in various ways, all of which are alike in principle. One method is to pour sulphuric acid and glycerine into a thin rubber tube which is weakened at one point to allow the acid to burn through quickly. When the acid burns through the tube, it drips onto a small amount of potassium permangenate which ignites the brick.

Incendiary Soap

Length: 4.17 inches.
Width: 2.67 inches.
Thickness: 1.45 inches.
Weight: 14 ounces.
Incendiary mixture: Barium nitrate, 30.4 percent; paraffin, 19.4 percent; magnesium, 11.3 percent; aluminum, 11.1 percent; rosin, 10.9 percent; ferrosoferric oxide, 9.1 percent; nitrocellulose, 4.4 percent; gritty siliceous material, 2.6 percent.

Figure 200—Incendiary Soap.

Description: This incendiary bar is specifically designed to resemble a bar of "Ivory" soap. The word "Ivory" is stamped on one side and "Proctor and Gamble" on the other. The bar burns with an intense flame, but is easily extinguished by water. It is difficult to ignite.

No method of ignition has been found, but it is probable that some type of ignition device is inserted into the recess in the side of the bar.

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Chapter 4

ARMY AMMUNITION

INTRODUCTION

Japanese Army weapons are generally copies of German or French designs or are developed following their customs. In comparison with weapons used by other countries in the past few years, the Japanese weapons appear to be outmoded and ineffective.

This is particularly true in considering small arms for if the Japanese ever made any serious attempt to standardize small arms and small arm ammunition there is little evidence of it in the many different calibers and types in use by them. The standard weapon prior to 1930 was 6.5 mm, but shortly thereafter this was superseded by 7.7 mm weapons. However, this change was never complete and 6.5 mm weapons were used extensively in the last war. The foreign influence is apparent particularly after 1939 when aircraft machine guns of German and Italian design were copied.

The earlier aircraft machine guns and aircraft cannon were either modifications of Japanese ground mounts or copies of foreign guns. In more recent years, however, the Japanese designed aircraft cannon as large as 120 mm, but nothing larger than 57 mm was ever put in service use.

Most Japanese artillery weapons were characterized by their immobility as very few of them were designed for rapid motor transport. Although 105 mm and 150 mm weapons were frequently encountered, the standard field piece was 75 mm.

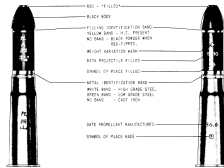
One outstanding characteristic of Japanese Army ammunition is the large variety of types and sizes of mortars which were in use. Mortars were used not only as infantry support weapons but also as artillery pieces. They ranged in size from the 50-mm Grenade Discharger to the 320-mm Spigot Mortar.

The standard Antiaircraft Gun was a 75-mm gun but there was also an 88-mm Antiaircraft Gun which was one of their most effective artillery pieces and a 105-mm A. A. gun. The Japanese has designed a 150-mm Antiaircraft Gun for the defense of the home islands but this was used only in the last few months of the war.

The newest trend in research and development in ammunition was along the line of rockets. Very few types of Japanese rockets were used during the war but there were many experimental models of antitank and artillery rockets in development, ranging in size from 75 mm to 60 cm.

Research was also being conducted on smoothbore and recoilless weapons but this was a relatively new program and none of these weapons was ever developed beyond the experimental stage.

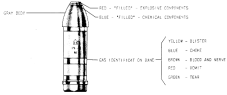
ARMY—OLD COLOR SYSTEM



Common Explosive Types

Japanese characters giving the type number of the projectile (painted on projectile) and type number of the gun (painted on the case) appear only when there is chance of confusion with similar projectiles or cases.

Chemical (Gas or Liquid Filled) Projectiles



Special-Purpose Projectiles

Projectiles designed for special purposes are painted black over all and are identified by a special symbol stenciled near the middle of the body. For a list of these projectiles and symbols, refer to the new color system.

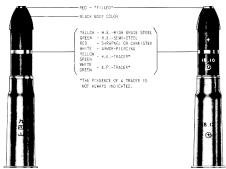
Weight Variation Marking

The variation of individual projectiles from standard weight is important in the ballistics problem and can be corrected for insetting sights. The variation is therefore indicated by plus or minus signs painted on the projectile.

Overweight	1.5 to 2.5 percent overweight.	++
	0.5 to 1.5 percent overweight.	+
Standard weight	0.5 percent plus or minus.	±
	0.5 to 1.5 percent underweight.	−
Underweight	1.5 to 2.5 percent underweight.	−−

ARMY—NEW COLOR SYSTEM

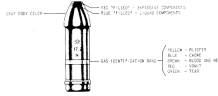
The new system is based on the old system, but is designed as a simplification in which fewer color bands are used. Body color of projectiles distinguishes broad groups. Color bands designate more specific features. The use of accessory markings such as type numbers, weight marks, dates, and arsenal symbols is the same in both systems.



Common Explosive Types

Hollow charge ammunition is distinguished from other types in the H. E. high grade steel (yellow band) group by the presence of the symbol タ

Chemical (Gas or Liquid Filled) Projectiles



Special-Purpose Projectiles

Projectiles designed for special purposes as listed below are identified by the over-all body color and by a special symbol stenciled near the middle of the body.

Projectile	Color of body	Symbol
Smoke (signal or screening).	White	ケ
Incendiary (nonliquid)	Yellow	ヤ
Illuminating	Red	ア
Target	Black	モ
Sand-filled	Black	ス

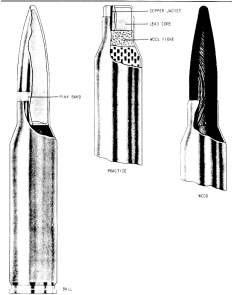


Figure 201—Type 38 6.5-mm Ammunition.

Chapter 4—Section 1

ARMY PROJECTILES

Type 38 6.5-mm Ammunition

	Ball	Training	Wooden
Over-all length	3 inches	$2\frac{1}{8}$ inches	$2\frac{31}{32}$ inches.
Length of case	2 inches	2 inches	2 inches.
Length of projectile	$1\frac{1}{4}$ inches	$\frac{3}{4}$ inch	$1\frac{19}{64}$ inches.
Weight of projectile	138 grams	34 grams	5 grams.

Construction:

Type	Projectile Jacket	Projectile Core
Ball	CuNi or steel	Lead.
Tracer	CuNi	Lead.
Blank	Projectile of wood.	
Blank	Projectile of paper.	
Practice ball (snub nosed)	Copper	Lead.

Weapons in which used:

Rifle	L. M. G.	A. A. M. G.
Type 38 rifle	Type 11 yr. L. M. G.	Type 3 yr. A. A. M. G.
Type 38 snipers rifle	Type 91 Vehicle L. M. G.	Type 38 A. A. M. G.
Type E rifle	Type 96 L. M. G.	
Type 38 carbine.		
Type 44 carbine.		

Color and markings:

Type	Bands
Ball	Pink.
Tracer	Green.
Blank	Wood.
Blank	Paper (purple).
Practice ball	Pink.

Remarks: Ammunition when used in rifles and light machine guns will be found in clips of 5 rounds each. When used in the heavy machine guns it will be found in feeder strips of 30 rounds each. The wooden bullet round is used with the rifle to launch the rifle smoke grenade. The paper bullet round is used to launch rifle grenades. The propelling powder used in the blank rounds is nitro-cellulose while in the other rounds it is graphite-coated nitro-cellulose.

Figure 202—Type 99 (Rimless) 7.7-mm Ammunition.

Type 99 (Rimless) 7.7-mm Ammunition

	Ball	A. P. (inch)	Tracer (inch)	Wooden
Over-all length	$3\frac{9}{64}$ inches	$3\frac{9}{64}$	$3\frac{9}{64}$	$3\frac{9}{64}$ inches.
Length of case	$2\frac{1}{4}$ inches	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$ inches.
Length of projectile	$2\frac{17}{64}$ inches	$2\frac{17}{64}$	$2\frac{17}{64}$	$2\frac{17}{64}$ inches.
Weight of projectile	181 grams			5 grams.

Construction:

Type	Projectile Jacket	Projectile core
Ball	CuNi	Lead.
Tracer	CuNi	Lead.
A. P	CuNi	Hard steel.
Blank	Projectile of wood.	
Blank	Projectile of paper.	

Weapons in which used:

Rifle	L. M. G.	H. M. G.
Type 99 rifle	Type 99 L. M. G	Type 92 H. M. G.
Type 99 modified rifle	Type 97 TK. M. G	Type 1 H. M. G.
Type 2 rifle.		

Color and markings:

Type	Bands
Ball	Pink.
Tracer	Green.
A. P	Black.
Blank	Wood.
Blank	Paper (purple).

Remarks: The heavy machine guns use feed strips of 30 rounds. When used in light machine guns and the rifle, this ammunition is packed in 5-round clips.

In addition to the usual brass cartridge cases, ammunition with a steel case has been found.

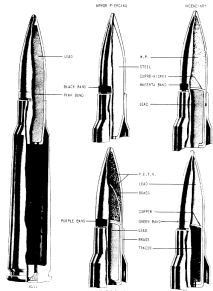


Figure 203—Type 92 (Semirimmed) 7.7-mm Ammunition.

Type 92 (Semi-rimmed) 7.7-mm Ammunition

		Ball	A. P.	Tracer	Incendiary	H. E.
Over-all length	inch	$3\frac{9}{64}$	$3\frac{9}{64}$	$3\frac{9}{64}$	$3\frac{9}{64}$	$3\frac{9}{64}$
Length of case	inch	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$
Length of projectile	inch	$1\frac{29}{64}$	$1\frac{29}{64}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Weight of projectile	grams	203	162	155	162	162

Construction:

Type	Projectile jacket	Projectile core
Ball	CuNi	Lead.
Tracer	CuNi	Lead.
A. P.	CuNi	Hard steel.
Incendiary	CuNi	W. P. and lead.
H. E.	CuNi	P. E. T. N. and lead.

Weapons in which used:
- Type 89 Flexible A. C. M. G.
- Type 89 Flexible A. C. M. G. (special).
- Type 89 Fixed A. C. M. G.
- Type 92 H. M. G.

Color and markings:

Type	Bands
Ball	Pink.
Tracer	Green.
A. P.	Black.
Incendiary	Magenta.
H. E.	Purple.

Remarks: The type 92 heavy machine gun uses feed strips of 30 rounds. When used for aircraft flexible machine guns, this ammunition is packed in 5-round clips in a manner corresponding to the packing of rimless, rifle ammunition, but the clip is of larger size to accommodate the larger bore of the semirimmed type.

The P. E. T. N. in the H. E. round is set off by the heat of impact.

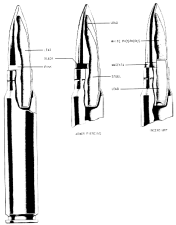


Figure 204—7.92-mm Aircraft Machine Gun Ammunition.

7.92-mm Aircraft Machine Gun Ammunition

	Ball	A. P.	Incendiary	H. E.
Over-all length (inch)	3 5/32	3 5/32	3 5/32	3 5/64
Length of case ...do	2 7/32	2 7/32	2 7/32	2 7/32
Length of projectile ...do	1 1/16	1 29/64	1 29/64	
Weight of projectile (grams)	180	182	182	

Construction:

Type	Projectile jacket	Projectile core
Ball	Gilding metal	Lead.
A. P.	CuNi	Hard steel.
Incendiary	CuNi	W. P. and lead.
H. E.	CuNi	P. E. T. N. and lead.

Weapons in which used:
- Bren type L. M. G.
- Type 98 flexible A. C. M. G.
- Type 100 flexible A. C. M. G.

Color and markings:

Type	Bands
A. P.	Black
Incendiary	Magenta
H. E.	White

Remarks: The Bren type L. M. G. uses a box-type magazine similar to the U. S. B. A. R. The type 98 and type 100 A. C. M. G. use a saddle type magazine.

8-mm Pistol Ammunition

Over-all length: 1¼ inches.
Length of case: 13/16 inch.
Length of projectile: 19/32 inch.
Weight of projectile: 102 grams.
Construction:
  Type: Ball.
  Projectile jacket: CuNi.
  Projectile core: Lead.

Weapons in which used:
  Nambu pistol.
  Type 14 pistol.
  Type 94 pistol.
  "Solothurn" submachine gun.
  "Bren Type" submachine gun.
  Type 100 submachine gun.

Remarks: The propelling case is rimless and made of brass. There is a tear-gas round, but specifications indicate that this is a relatively large missile and it is probably launched from the pistol somewhat in the manner of launching grenades from a rifle.

9-mm Pistol Ammunition

Over-all length: 1⅛ inches.
Length of case: 27/32 inch.
Length of projectile: ⅝ inch.
Weight of projectile: 150 grams.

Figure 205—8-mm Pistol Ammunition.

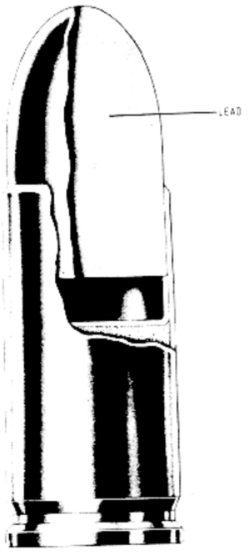


Figure 206—9-mm Pistol Ammunition.

Construction:
  Type: Ball.
  Projectile jacket: CuNi.
  Projectile core: Lead.
Weapons in which used:
  Type 26 revolver (Webley type).
  Smith and Wesson pistol.

Remarks: The propelling case is rimless and made of brass. There is a tear-gas round, similar to that mentioned for the 8-mm pistol.

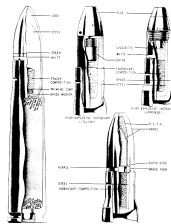


Figure 207—12.7-mm Aircraft Cannon Ammunition.

12.7-mm Aircraft Cannon Ammunition

		A. P. T.	A. P. (Italian)	H. E. I. (Italian)	H. E. I.	H. E. I. (fuzeless)
Over-all length	(inches)	4 7/32	4 1/2	4 7/32	4 5/32	4 5/32.
Length of case	(inches)	3 3/16	3 3/16	3 3/16	3 3/16	3 3/16.
Length of projectile	(inches)	1 3/4	2 15/64	2	1 7/8	2.
Weight of projectile	(ounces)	1.25	1.35	1.35	1.21	1.16.

Construction:

Type	Projectile jacket	Projectile core
Ball	CuNi	Lead.
A. P. T	Brass	Steel.
H. E. I. (fuzed Japanese)	Brass	P. E. T. N. incendiary and steel.
H. E. I. (fuzed Italian)	Brass	P. E. T. N. incendiary and steel.
H. E. I. (fuzeless)	Brass	P. E. T. N. incendiary and steel.
Tracer	CuNi	Steel.
A. P. (Italian)	Gilding metal	Lead tip, steel core.

Weapons in which used: HO 103 A. C. M. G.

Color and markings:

Type	Color Bands
Ball	Red.
A. P. T	Black or green and white.
H. E. I. fuzed	White.
H. E. I. fuzeless	Purple.
H. E. I. fuzed (Italian)	Red, blue, or green body.
Tracer	Green.
A. P. (Italian)	Black tip on nose.

Fuzing: Italian 12.7 mm. fuze or Japanese 12.7-mm fuze.

Remarks: This ammunition was copied by the Japanese from the Italians. Of the two H. E. I. fuzed rounds, one is Italian and the other is a Japanese copy of it. The Japanese H. E. I. fuzed differs from the Italian round in that the fuze used is of two-piece construction instead of one.

This ammunition is packed in 10-round cartons and is reloaded into metal link belts for use.

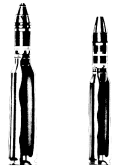


Figure 208—Type 97 and Type 98 20-mm Ammunition.

Type 97 and Type 98 20-mm Ammunition

There are four Army 20-mm guns using similar projectiles and three of these guns use the same cartridge case. The guns using the small size cartridge case are the type 97 antitank gun, the Ho 1 (flexible) and Ho 3 (fixed) aircraft guns. The type 98 antiaircraft/antitank gun uses the large size cartridge case.

Case:	**Small**	**Large**
Length	4. 89	5. 58
Diameter of base	1. 12	1. 12
Weight (empty) (grams)	129. 9	208. 3

Both cases are made of drawn brass and are of the rimless type. The case is crimped to the projectile by three long crimps and sealed by a clear lacquer.

Propellant: The propellant is graphited smokeless powder made in single perforated cylindrical grains approximately 1½ mm in diameter and 3 mm in length. The weight of the propellant in the small case is 35.8 grams and, in the large case, 58.9 grams.

20-mm High-Explosive Tracer Projectile

Over-all length: $8\frac{3}{16}$ inches.
Length of projectile: $3\frac{13}{64}$ inches.
Weight of projectile: 4.54 ounces.
Filling: Cyclonite, tracer composition.
Color and markings: Black body with yellow band just aft of bourrelet and white band forward of rotating band.
Fuzing: Type 93 small instantaneous fuze.
Weapons in which used: Type 98 antiaircraft/-antitank gun.

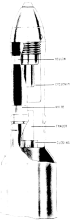


Figure 209—20-mm High-Explosive Tracer Projectile.

Remarks: This projectile is made of steel with two cavities separated by a septum. The round is characterized by a sharp bourrelet.

Type 98 20-mm High-Explosive Tracer Projectile

Over-all length: $7\frac{29}{64}$ inches.
Length of projectile: $2\frac{13}{32}$ inches.

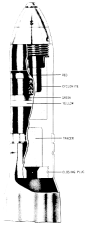


Figure 210—Type 98 20-mm High-Explosive Tracer Projectile.

Filling: Cyclonite, tracer composition.
Fuzing: Type 93 small instantaneous fuze.
Color and markings: Black body with red band just aft of bourrelet, green, and yellow bands forward of rotating band. 九八式 (Type 98) is stenciled on the body.
Weapons in which used: Type 97 antitank gun.

Remarks: This projectile is made of steel, with two cavities separated by a septum.

Figure 211—Type 100 20-mm High-Explosive Tracer (Self-Destroying) Projectile.

Type 100 20-mm H. E. T. (Self-Destroying) Projectile

	Type 97 A/TK	Type 98 AA/A/TK
Over-all length	$7\frac{5}{8}$ inches	$8\frac{13}{64}$ inches.
Length of projectile.	$3\frac{15}{64}$ inches	$3\frac{15}{64}$ inches.
Weight of projectile.	4.7 grams.	4.7 grams.

Filling: Cyclonite, tracer composition.
Fuzing: Type 100 experimental projectile used type 93 small instantaneous fuze; other two projectiles use type 100 small instantaneous fuze.
Color and markings: Black body with red band just aft of bourrelet, green and yellow bands forward of rotating band. Type 100 has 一〇〇式 stenciled on body, type 100 experimental has 一〇〇式試 stenciled on body, and type 100 Mod 1 has 一〇〇式修 stenciled on body.
Weapons in which used:
Type 97 antitank gun.
Type 98 antiaircraft/Antitank gun.

Remarks: The projectile is made of steel with two cavities separated by a septum. Leading through the septum and into the explosive cavity is a black powder lead-in. When the tracer has burned out it will ignite the lead-in which will detonate the explosive filling.

There is an earlier model of this projectile, designated type 100 Experimental which does not have a self-destroying feature.

There is also a type 100 Mod 1 which differs from this projectile in that it is filled with black powder instead of cyclonite.

20-mm High Explosive Incendiary Projectile

Over-All length: $7\frac{19}{32}$ inches.
Length of case: $4\frac{7}{8}$ inches.
Length of projectile: $3\frac{5}{16}$ inches.
Weight of projectile: 4.48 ounces.
Filling: Cyclonite, incendiary composition.
Fuzing: Type 93 small instantaneous fuze.

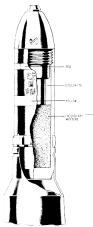


Figure 212—20-mm High-Explosive Incendiary Projectile.

Color and markings: Black body with red band just abaft bourrelet, yellow band forward of rotating band. The characters

旋 固 機

(fixed or flexible machine cannon) are stenciled down the body.

Weapons in which used: Ho–1 (flexible) and Ho–3 (fixed) aircraft cannon.

Remarks: The projectile is made of steel. It contains two pellets, the forward one, surrounding the fuze gaine, is cyclonite while the after pellet is an incendiary mixture.

20-mm High-Explosive Incendiary (Ma 201) Projectile

Over-All length: $7\frac{19}{32}$ inches.
Length of case: $4\frac{7}{8}$ inches.

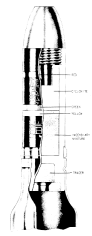


Figure 213—20-mm High-Explosive Incendiary (MA 201) Projectile.

Length of projectile: $3\frac{15}{64}$ inches.
Weight of projectile: 3.85 ounces.
Filling: P. E. T. N., incendiary composition.
Fuzing: Fuzeless.
Color and markings: Black body with red band abaft bourrelet. Characters 二〇一 (201) are stencilled on the body.
Weapons in which used: Ho–1 (flexible) and Ho–3 (fixed) aircraft cannon.

Remarks: The projectile is made of steel. A brass nose piece filled with P. E. T. N. threads into the incendiary filled projectile. Detonation of the projectile is accomplished by the crushing action of the P. E. T. N. filled nose piece.

20-mm High-Explosive Incendiary Tracer Projectile

Over-All length: 7 $\frac{11}{16}$ inches.
Length of projectile: 4 $\frac{23}{32}$ inches.
Length of case: $4\frac{7}{8}$ inches.
Filling: Cyclonite, incendiary composition, tracer composition.
Fuzing: Type 100 small instantaneous fuze.
Color and markings: Black body with red band just abaft bourrelet, green and yellow bands before rotating band. Characters

旋 固 機

(flexible or fixed machine cannon) stenciled on body.
Weapons in which used: Ho–1 (flexible) and Ho–3 (fixed) aircraft cannon.

Remarks: The projectile is made of steel and has two cavities, a main charge cavity and a tracer cavity, separated by a septum. The main charge cavity contains two pellets, the forward one, fitting around the fuze gaine, is cyclonite while the after one is an incendiary mixture.

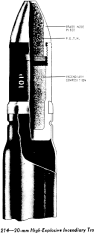


Figure 214—20-mm High-Explosive Incendiary Tracer Projectile.

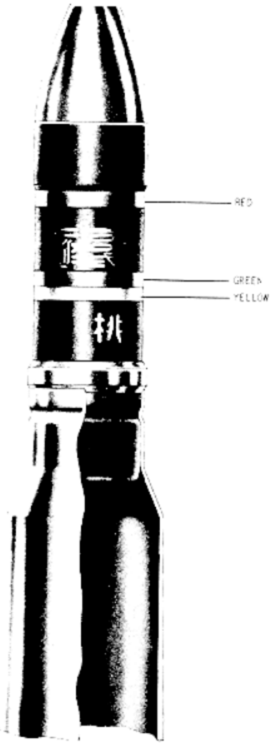


Figure 215—Type 100 Mod 2 20-mm I. T. (Self-Destroying) Projectile.

Type 100 Mod 2 20-mm I. T. (Self-Destroying) Projectile

Over-All length: $8\frac{13}{64}$ inches.
Length of projectile: $3\frac{15}{64}$ inches.
Filling: Incendiary composition, tracer composition.
Fuzing: Type 100 small instantaneous fuze.
Color and markings: Black body with red band just abaft bourrelet, green and yellow bands before rotating band. Characters

一〇〇式二修

(type 100 Mod 2)

are stenciled on body.
Weapons in which used: Type 98 antiaircraft/antitank gun.

Remarks: This is the same projectile as the type 100 and type 100 Mod 1 H. E. T., but there is no high explosive other than that used in the gaine.

20-mm Armor-Piercing Tracer Projectile

	Type 97 A/TK	**Ho–1 and Ho–3**
Over-all length	$7\frac{5}{8}$ inches	$7\frac{5}{8}$ inches.
Length of case	$4\frac{7}{8}$ inches	$4\frac{7}{8}$ inches.
Length of projectile.	$3\frac{5}{32}$ inches	$3\frac{5}{32}$ inches.
Weight of projectile.	5.5 ounces	5.5 ounces.

	Type 98 A.A. A/TK
Over-all length	$8\frac{1}{4}$ inches.
Length of case	$5\frac{1}{2}$ inches.
Length of projectile	$3\frac{5}{32}$ inches.
Weight of projectile	5.5 ounces.

Filling: Tracer composition.
Color and marking: Hard round (type 100): black body, green and white bands before rotating band medium round (type 97): has

一〇〇式

(type 100)

stenciled on the body, black body, green band before rotating band soft round (type 97 substitute): black over-all.
Weapons in which used: Type 97 antitank gun, Ho–1 (flexible) and Ho–3 (fixed) aircraft cannon, type 98 antiaircraft/antitank gun.

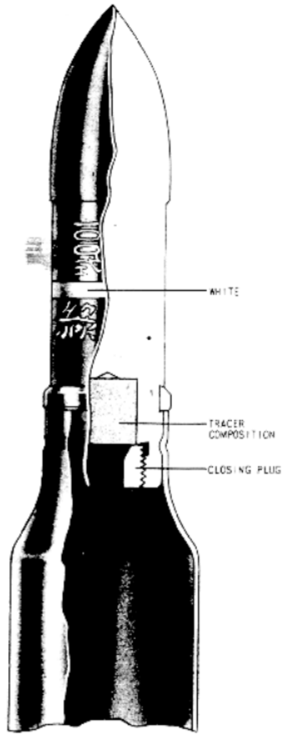


Figure 216—20-mm Armor-Piercing Tracer Projectile.

Remarks: This projectile is a solid steel shot with a tracer cavity drilled into the base. This projectile, with different colored tracers and markings, is used in three guns. There are three types of rounds differing in grades of hardness of steel.

Ho-5 20-mm Ammunition

The latest Army 20-mm gun developed is the Ho-5 aircraft gun which is of excellent design and represents a considerable improvement over previous Army 20-mm aircraft machine guns.

Case:

Length: 3$\frac{11}{16}$ inches.
Diameter of base: $\frac{31}{32}$ inches.
Material: Brass.
Weight (empty): 113.5 grams.

The case is of the rimless type and has a slight taper toward the neck.

Propellant: The propellant is 21.4 grams of graphited smokeless powder in fine cylindrical grains.

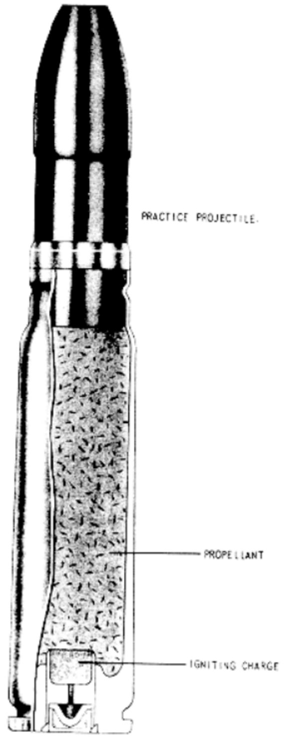


Figure 217—HO-5 20-mm Ammunition.

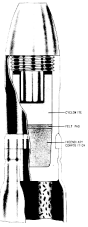


Figure 218—Type 2 and Type 2 Modified 20-mm High-Explosive Incendiary Projectile.

Type 2 and Type 2 Modified 20-mm H. E. I. Projectile

Over-all length: 5¾ inches.
Length of projectile: 2 9/16 inches (fuzed).
Weight of projectile: 77.4 grams (fuzed).
Weight of filling:
  Cyclonite, type 2 modified: 3.4 grams.
  Cyclonite, type 2: 0.4 grams.
  Incendiary composition: 3.7 grams.
Filling: Cyclonite and incendiary composition.
Fuzing:
  Type 2: Type 2 Small Instantaneous or type 2 small instantaneous modified fuze.
  Type 2 Modified: Type 4 super-detonating fuze.
Color and markings:
  The type 2 projectile is painted black over all and in some cases has a yellow band around body.
  Type 2 modified projectile is painted silver-gray over all.

Remarks: The difference between the type 2 and the type 2 modified is in the fuze. The type 2 projectile uses a fuze that has an external gaine and thus has less explosive filling than the type 2 modified projectile which uses a fuze with the gaine built into the fuze body.

Type 4 20-mm H. E. T. (Ma 202) Projectile

Over-all length: 5¾ inches.
Length of projectile: 2 9/16 inches.
Weight of projectile: 78.2 grams (fuzed).
Weight of filling:
  P. E. T. N.: 3.2 grams.
  Incendiary composition: 8.7 grams.
Filling: P. E. T. N. and incendiary composition (barium nitrate, aluminum powder, magnesium powder, and wax).
Fuzing: Fuzeless.
Color and markings: Black over all with characters 二〇二 (202) stenciled on the body.

Remarks: The projectile is made of steel with a brass nose piece threaded to it. The nose piece is filled with P. E. T. N. and is designed to explode by the crushing action of impact. An

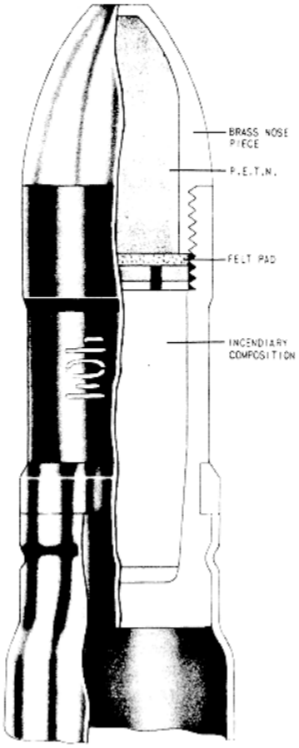


Figure 219—Type 4 20-mm High-Explosive Incendiary (MA 202) Projectile.

incendiary mixture contained in the steel body is separated from the high explosive by a felt pad and a threaded brass disc. This disc has two lead-in holes.

Type 2 20-mm Armor-Piercing Tracer Projectile

Over-All length: 5¾ inches.
Length of projectile: 2½ inches.
Weight of projectile:
  Soft round: 112. 7 grams.
  Medium round: 116.7 grams.
  Hard round: 119.5 grams.
Weight of filling: 7.0 grams.
Filling: Tracer composition
Color and markings:
  Soft round: black over-all.
  Medium round: black with green band around body.

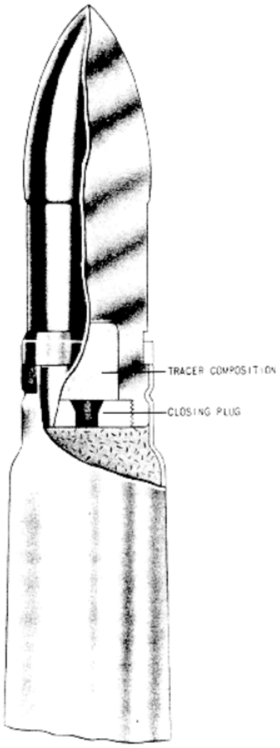


Figure 220—Type 2 20-mm Armor-Piercing Tracer Projectile.

Hard round: Black with a green and a white band around body. Characters

二式

(type 2)

are stenciled on the body.

Remarks: There are three different models of this projectile differing in the grades of hardness of the steel. This difference is indicated by the color markings.

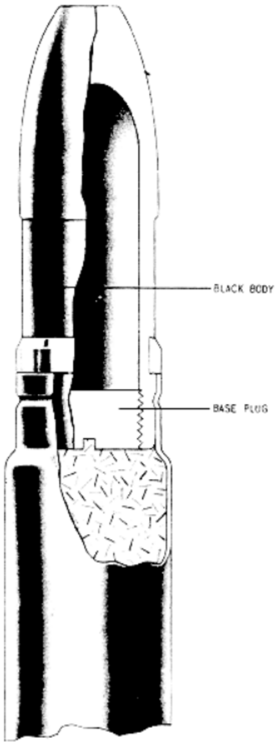


Figure 221—20-mm Practice Projectile.

20-mm Practice Projectile

Over-All length: 5¾ inches.
Length of projectile: $2\frac{9}{16}$ inches.
Weight of projectile: 81.0 grams.
Filling: None.
Color and markings: Black over-all.

Remarks: The projectile approximates the shape of the type 2 H.E.I. projectile. It is unfilled and closed at the base by a threaded plug.

37-mm High-Explosive Incendiary Projectile

Over-all length of projectile: 89 mm (3½ inches) without fuze.
Length of complete round: 197 mm (7¾ inches) fuzed.
Diameter at bourrelet: 37 mm (± tol.).
Width of rotating band: 10 mm ($\frac{25}{64}$ inch).
Weight of projectile filled: 436.2 grams.
Filling: Cyclonite and incendiary mixture.
Weapons in which used: Ho–203 aircraft cannon.
Case:

Length: 111.5 mm.
Diameter at base: 47.0 mm.
Weight (empty): 226.5 grams.

The case is comparatively short, made of brass, and is slightly necked.

Propellant: Graphited smokeless powder in flat 4-mm squares poured loosely into the case and sealed in with a cardboard disc. The weight of the propellant is 59.8 grams.

Color and markings: Black body, red nose band, yellow body band. Characters

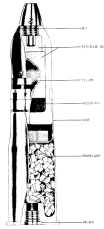
ホ二〇三

(Ho 203)

are stenciled on the body.

Fuzing: Type 100 small instantaneous fuze.

Remarks: This projectile is constructed in two pieces. It has a nearly straight-sided main body and an ogival-shaped nose piece which threads into the main body. The main charge is cyclonite and an incendiary mixture. The incendiary mixture is pressed into the base of the cavity, with the cyclonite filling the remainder of the cavity and the nose piece.



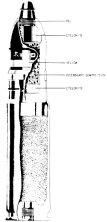


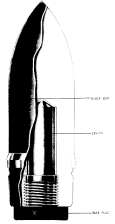
Figure 222—37-mm High-Explosive Incendiary Projectile.

There is also an empty practice projectile similar in appearance to the H. E. I. but having the nose piece and dummy fuze constructed in one piece. The projectile is painted black overall and has ホ二〇三 (Ho 203) and マ四三八 (Ma 438) stenciled on the body.

37-mm High-Explosive Incendiary Projectile

Over-all length of projectile: .89 mm (3½ inches) without fuze.
Length of complete round: 246 mm ($9\frac{23}{32}$ inches) fuzed.
Diameter at bourrelet: 37 mm (± tol.).
Width of rotating band: 10 mm.
Weight of projectile empty: 398.3 grams.
Filling: Mixture of cyclonite and wax and incendiary composition.

Figure 223—37-mm High-Explosive Incendiary Projectile.



Weapons in which used: Ho 204 aircraft cannon.
Case:
  Length: 144.0 mm.
  Diameter at base: 43.5 mm.
  Weight (empty): 381.2 grams.
  The case is of the rimless type and is slightly necked.
Propellant: Graphited smokeless powder in flat 4 mm squares poured loosely into the case and sealed in with a cardboard disk. The weight of the propellant is 75.1 grams.
Color and markings: Black body, red nose tip, yellow body band. Characters

ホ二〇四

(Ho 204)

are stenciled on the body.
Fuzing: Type 4 super-detonating fuze.

Remarks: The ammunition for the Ho 204 uses the same projectile as the Ho 203 ammunition, but the case is longer.

The projectile is constructed in two pieces: a straight sided main body and an ogival-shaped nose which screws into the main body. There is only one cavity into which both the incendiary and high-explosive filling are pressed.

Figure 224—37-mm Practice Projectile.

37-mm Practice Projectile

Over-all length of projectile: 124 mm ($4\frac{7}{8}$ inches).
Length of case: 144 mm ($5\frac{21}{32}$ inches).
Length of complete round: 247 mm ($9\frac{11}{16}$ inches.)
Diameter at bourrelet: 37 mm (±tol.).
Width of rotating band: 8 mm.
Filling: Sawdust.
Weapons in which used: Ho 204 aircraft cannon.
Color and markings: Black over-all.
Fuzing: None.

Remarks: This projectile has the appearance of an A. P. projectile. It is sawdust filled and has the cavity closed by a base plug.

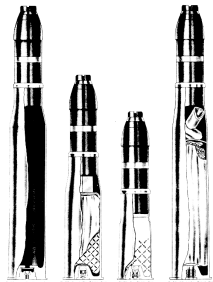


Figure 225—37-mm Ammunition.

37-mm Ammunition

There are eight 37-mm antitank and tank guns, all sizes of which use the same projectiles but have different cartridge cases. Presented below is information on the cases and the propellant.

Cases:

Gun	Diameter at base (inches)	Weight (empty) (ounces)	Case length (inches)	Markings
Type 11th year infantry		7.6	4⅜	十一平歩
Type 94 tank	1 27/32	9.4	5¼	九四戰
Type 94 antitank*	2⅛	13.0	6½	九四石包
Type 98 tank*	2⅛	13.0	6½	九八戰
Type 100 tank*	2⅛	13.0	6½	一〇〇戰
Type 97 antitank**	2	15.1	9⅞	
Type 1 antitank**	1 61/64	22.7	9⅞	
Type 1 tank	1 61/64	22.7	9⅞	一戰

*Since the type 94 antitank, type 98 tank, and type 100 tank guns use the same cartridge case, cases will be found marked for individual guns or for all three guns.

**The cases for the type 97 and type 1 antitank guns can be distinguished by the fact that the type 97 is almost straight, whereas the type 1 has a pronounced neck. The type 1 tank and type 1 antitank guns use the same case.

Propellant:

Type 11th year infantry gun: 1.85 oz. of graphited smokeless powder in the form of flakes poured into the case and sealed with a cardboard closing disc.

Type 94 tank gun: 2.7 oz. of graphited smokeless powder in the form of rectangular flakes.

Type 94 antitank gun, type 98 gun, and type 100 tank gun: 4.3 ounces of graphited smokeless powder in the form of unitubular grains contained in a silk bag.

Type 97 antitank gun: 5.0 ounces of graphited smokeless powder in the form of short, cylindrical grains contained in a silk bag.

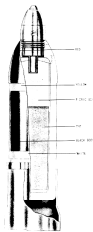


Figure 226—37-mm Type 94 High-Explosive Projectile.

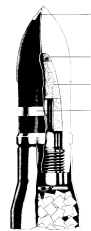


Figure 227—Type 94 37-mm Armor-Piercing High-Explosive Projectile.

Type 94 37-mm High-Explosive Projectile

	Type 97 A/TK	Type 94 A/TK	Type 94 TK	Type 1 A/TK Type 1 TK	Type 11th Yr. Inf.
Over-all length of projectile	125 mm w/o fuze.	125 mm w/o fuze.	125 mm w/o fuze.	125 mm w/o fuze.	125 mm w/o fuze.
Length of complete round	349 mm fuzed.	266 mm fuzed.	223 mm fuzed.	349 mm fuzed.	221 mm fuzed.
Diameter at bourrelet	37 mm	37 mm	37 mm	37 mm	37 mm.
Width of rotating band	8 mm	8 mm	8 mm	8 mm	8 mm.

Weight of projectile filled: 595.1 grams.
Filling: Picric acid and TNT.
Weapons in which used: All 37-mm guns.
Color and markings: Black body, red nose band, yellow body band (some rounds may have white body band added).
Fuzing: Type 93 small instantaneous fuze.

Remarks: This steel projectile is filled with TNT and picric acid. The after two-thirds of the projectile cavity is filled with high grade cast TNT. The forward one-third of the projectile cavity is filled with picric acid. The entire bursting charge is enclosed in a heavy waxed paper casing with a double thickness between the TNT and picric acid charge.

Type 94 37-mm Armor-Piercing High-Explosive Projectile

	Type 94 TK	Type 94 A/TK	Type 97 A/TK	Type 11th Yr. Inf.
Over-all length of projectile	114 mm w/o fuze.	114 mm w/o fuze.	114 mm w/o fuze.	114 mm w/o fuze.
Length of complete round	228 mm fuzed.	262 mm fuzed.	345 mm fuzed.	218 mm fuzed.
Diameter at bourrelet	37 mm	37 mm	37 mm	37 mm.
Width of rotating band	9.5 mm	9.5 mm	9.5 mm	9.5 mm.

Weight of projectile filled: 1 pound ¼ ounce.
Filling: Picric acid.
Weapons in which used:
  Type 11th year Infantry gun.
  Type 94 TK gun.
  Type 94 antitank gun.
  Type 97 antitank gun.
  Type 98 TK gun.
  Type 100 TK gun.
Color and markings: Black body, red nose tip, white body band.
Fuzing: Type 94 small-delay base fuze.

Remarks: This projectile is made of high grade steel. The main charge cavity contains a small wooden plug in the forward portion and a paper covered picric acid charge aft of the wooden nose plug. The Type 94 small delay base fuze screws into the base of the projectile, also acting as a base plug.

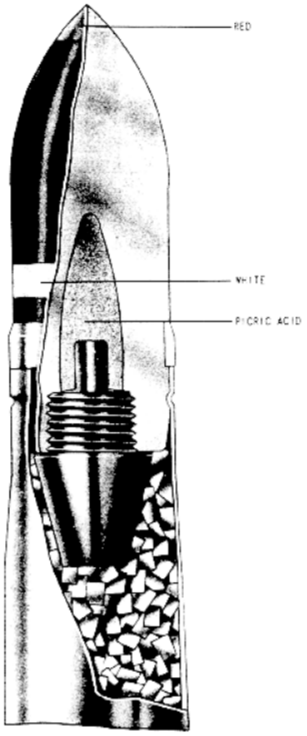


Figure 228—Type 1 37-mm High-Explosive Projectile.

Type 1 37-mm High-Explosive Projectile

	Type 94 A/TK	**Type 1 A/TK**
Over-all length of projectile	104 mm w/o fuze.	104 mm w/o fuze.
Length of complete round	250-mm fuzed.	333-mm fuzed.
Diameter at bourrelet	37 mm	37 mm.
Width of rotating band	11 mm	11 mm.

Weight of projectile: 1 pound 6 ounces without explosive.
Filling: Picric acid.
Weapons in which used:
  Type 1 tank gun.
  Type 1 antitank gun.
  Type 94 antitank gun.

Color and markings: Black body, red nose tip, white body band.
Fuzing: Small Mk 1 base fuze.

Remarks: This projectile is constructed of high grade steel. It has no sharply defined bourrelet. It uses a small Mk 1 base fuze which also acts as a base plug.

40-mm Ho–301 High-Explosive Projectile

Projectile Dimensions:

Length of projectile (fuzed): 129 mm ($5\frac{3}{32}$ inches) fuzed.
Length of projectile (without fuze): 108 mm (4¼ inches).

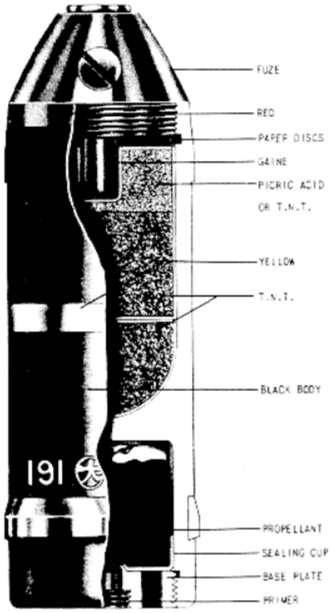


Figure 229—40-mm HO–301 High-Explosive Projectile.

Distance base to rotating band (lower edge): 15 mm ($\frac{19}{32}$ inch).
Width of rotating band: 8 mm ($\frac{5}{16}$ inch).
Diameter of rotating band: 41 mm ($1\frac{5}{8}$ inches).
Diameter of body: 39 mm ($1\frac{17}{32}$ inches).
Diameter of bourrelet: 39.5 mm ($1\frac{9}{16}$ inches).
Width of bourrelet: 6 mm ($\frac{1}{4}$ inch).
Distance base to bourrelet (lower edge): 91 mm ($3\frac{19}{32}$ inches).
Wall thickness (propellant chamber): 5 mm ($\frac{13}{64}$ inch).
Wall thickness (H. E. chamber): 4 mm ($\frac{9}{64}$ inch).

Weights:

Complete round fuzed: 1 pound, 4.7 ounces.
H. E. charge: 2 ounces.
Propellant: 0.4 ounce (10 grams).
Primer: 0.1 ounce.
Fuze, with gaine: 2.1 ounces
Gaine: 0.2 ounce.

Primer Dimensions:

Length: 9 mm ($\frac{11}{32}$ inch).
Diameter (threads): 12 mm ($\frac{15}{32}$ inch).
T. P. I.: 34 L. H

Weapon in which used: (Ho 301 40-mm aircraft cannon): This is an unusual weapon similar in design to an Oerlikon blow-back operated cannon, but with the head of the bolt machined as a piston which closes the breech at the forward end of its stroke.

Filling: The filling consists of TNT with a forward pellet of picric acid or TNT.

Propellant: The propellant consists of small, greenish-gray, square flakes of smokeless powder (approximately 1 mm square) enclosed in a silk bag which is inserted in the after cavity of the projectile. A sealing cup of thin aluminum fits around the after end of the propellant bag and the charge and cup are held in by a perforated base plate which screws (L. H.) into the base of the cavity. The base plate has an outer ring of twelve $\frac{3}{16}$-inch holes and a central hole threaded (L. H.) to receive the small flush primer. The aluminum sealing cup is perforated by a single hole in the center to permit the flash from the primer to reach the propellant. The force of the propellant gases blows through the aluminum cup to open the main series of holes.

Fuze: This is a simple direct-acting nose fuze with a central axial striker held in the unarmed condition by a slotted safety block which in turn is held by two spring-loaded detents.

Remarks: There is also a practice projectile which has the same dimensions and appearance as the H. E. projectile. It is painted black over all and has a nose plug instead of a fuze.

Type 1 47-mm High-Explosive Projectile

Weight of complete round: 2.44 kg. (5.4 pounds).
Weight of projectile (without fuze): 1.15 kg. (2.5 pounds).
Weight of filling: 0.087 kg. (0.2 pound).
Filling: Two preformed paper-wrapped blocks taped together and waxed. The forward block consists of two pellets of picric acid—a ring pellet around the gaine and a solid pellet beneath the gaine. The after block is one piece of cast TNT.
Diameter at bourrelet: 47 mm (minus tol.).
Length of projectile (without fuze): 140 mm ($5\frac{1}{2}$ inches).
Length of propellant case: 283 mm ($11\frac{1}{8}$ inches).
Length of assembled round (without fuze): 389 mm ($15\frac{5}{16}$ inches).
Diameter of base of case: 72 mm ($2\frac{13}{16}$ inches).
Weapons in which used:
  Type 1 antitank gun.
  Type 1 tank gun.
Fuzing: Type 88 Inst. Nose fuze (gun type), type 88 short-delay nose fuze (gun type).

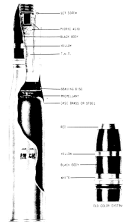


Figure 230—Type 1 47-mm High-Explosive Projectile.

Weight of propellant: 0.398 kg. (0.9 pound).

Propellant: Single perforated cylindrical grains (7/16 inch long, 5/32 inch diameter) of a graphited double-base powder of the following composition:

Nitrocellulose: 60.0 percent.
Nitroglycerine: 34.5 percent.
Ethyl centralite: 3.0 percent.
Diphenyl formamide: 2.5 percent.

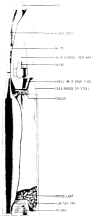


Figure 231—Type 1 47-mm Armor-Piercing Projectile.

Type 1 47-mm Armor-Piercing Projectile

Weight of complete round: 2.75 kg. (6.1 pounds).
Weight of projectile, fuzed: 1.38 kg. (3.0 pounds).
Weight of projectile (without fuze): 1.27 kg. (2.8 pounds).
Weight of filling: 0.018 kg. (0.04 pound).
Filling: RDX, 90 percent; paraffin, 10 percent.
Diameter at bourrelet: 47 mm. (minus tol.).
Length of projectile (without fuze): 143 mm (5⅝ inches).
Length of propellant case: 283 mm (11⅛ inches).
Length of assembled round: 398 mm (15⅝ inches).
Diameter of base of case: 72 mm ($2\frac{13}{16}$ inches).
Width of rotating band: 12 mm.
Weapons in which used: Type 1 antitank gun, type 1 tank gun.
Fuzing: Small Mk 2 base fuze (short-delay).
Tracer: Yellow, 5 grams.
Weight of propellant: 0.398 kg. (0.9 pound).
Propellant: Single perforated cylindrical grains ($\frac{7}{16}$ inch long, $\frac{5}{32}$ inch in diameter) of a graphited double-base powder of the following composition:
    Nitrocellulose: 60.0 percent.
    Nitroglycerine: 34.5 percent.
    Ethyl centralite: 3.0 percent.
    Diphenyl formamide: 2.5 percent.

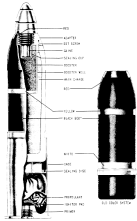


Figure 232—Type 90 5.7-cm High-Explosive Projectile.

Type 90 5.7 cm (57-mm) High-Explosive Projectile

Weight of complete round: 2.91 kg. (6.40 pounds).

Weight of projectile, filled (fuzed): 2.36 kg. (5.18 pounds).

Weight of filling: 0.25 kg.

Filling: TNT.

Diameter at bourrelet: 57 mm (minus tol.).

Length of projectile (without fuze): 181 mm (7⅛ inches).

Length of propellant case: 121 mm (4¾ inches).

Length of assembled round (without fuze and adapter): 280 mm (11 inches).

Width of rotating band: 9.5 mm.

Weapons in which used: Type 90 tank gun, type 97 tank gun.

Fuzing: Type 88 short-delay fuze.

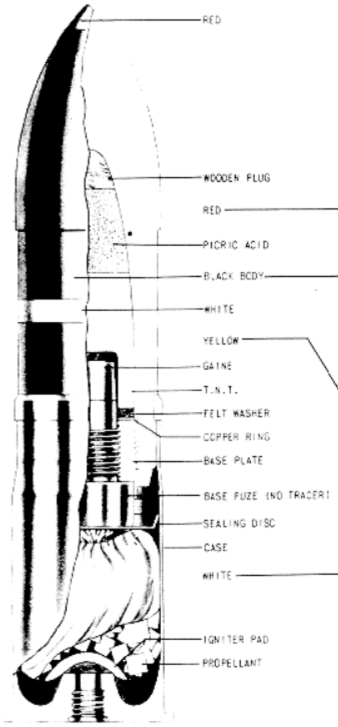
Propellant: Mk 1 square grain (med.), 113 grams.

Figure 233—Type 90 5.7-cm Substitute Projectile.

Type 90 5.7-cm (57-mm) Substitute Projectile

Weight of complete round: 3.04 kg. (6.70 pounds).
Weight of projectile, filled: 2.23 kg. (4.91 pounds).
Weight of filling: 0.07 kg.
Filling: Black powder.
Diameter at bourrelet: 57 mm (2 1/4 inches).
Length of projectile (without fuze): 183 mm (7 13/64 inches).
Length of propellant case: 121 mm (4 3/4 inches).
Length of assembled round (without fuze): 272 mm (10 11/16 inches).
Width of rotating band: 9.5 mm.
Weapons in which used: Type 90 tank gun, type 97 tank gun.
Fuzing: Type 88 short-delay fuze.
Propellant: Mk 1 sq. grain (med.), 113 grams.

Remarks: This projectile is made of cast iron and has very thick walls.



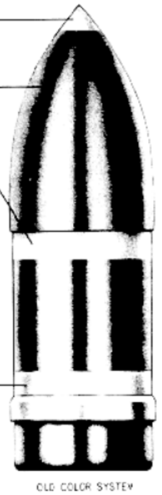


Figure 234—Type 92 5.7-cm Armor-Piercing Projectile.

Type 92 5.7-cm (57-mm) Armor-Piercing Projectile

Weight of complete round: 3.13 kg. (6.89 pounds).
Weight of projectile, filled (fuzed): 2.58 kg. (5.68 pounds).
Weight of filling: 0.10 kg.
Filling: Two sections of explosive, individually wrapped in paper: Upper section, pressed picric acid and wax; lower section, cast TNT.
Diameter at bourrelet: 57 mm (minus tol.).
Length of projectile (without fuze adapter): 181 mm (7¾ inches).
Length of propellant case: 121 mm (4¾ inches).
Length of assembled round: 280 mm (11$\frac{1}{16}$ inches).
Width of rotating band: 10 mm.
Weapons in which used: Type 90 tank gun, type 97 tank gun.
Fuzing: Type 92 small base fuze.
Propellant: Mk 1 sq. grain (med.), 113 grams.

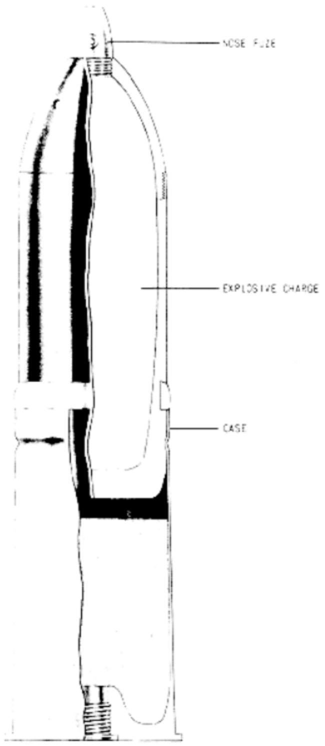


Figure 235—57-mm HO–401 High-Explosive Projectile.

57-mm Ho–401 High-Explosive Projectile

Weight of complete round: 2.15 kg. (4.75 pounds).
Weight of projectile, filled (fuzed): 2.58 kg. (3.25 pounds).
Weight of filling: No data.
Filling: No data.
Diameter at bourrelet: 57 mm (2¼ inches).
Length of projectile (without fuze): 163 mm ($6\tfrac{27}{64}$ inches).
Length of propellant case: 121 mm (4¾ inches).
Length of assembled round: 270 mm (10⅝ inches).
Width of rotating band: 11 mm.
Weapons in which used: Ho–401 aircraft cannon.
Fuzing: No data.
Propellant: No data.

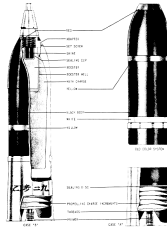


Figure 236—Type 92 7-cm High-Explosive Projectile.

Type 92 7-cm (70-mm) High-Explosive Projectile

Weight of complete round: 4.48 kg. (9.90 pounds).
Weight of projectile fuzed: 3.81 kg. (8.38 pounds).
Weight of filling: 0.59 kg.

Filling:
- Standard, cast TNT.
- Alternate, pressed mixture of RDX and ammonium nitrate.

Diameter at bourrelet: 70 mm (minus tol.).
Length of projectile (without fuze): 234 (9¼ inches).
Length of propellant case: 101 mm (4 inches).
Length of assembled round (without fuze): 306 mm (12$\frac{1}{16}$ inches).

Diameter of base of case: 81 mm ($3\frac{3}{16}$ inches).
Width of rotating band: 10 mm.
Weapons in which used: Type 92 infantry gun (howitzer).
Fuzing:
  Type 88 instantaneous nose fuze (howitzer, mortar type).
  Type 88 short-delay nose fuze (howitzer, mortar type).

Propellant: 50 grams of smokeless powder in 0.5 mm square flakes. This powder is contained in four pads made by sewing portions of the powder between two dark blue silk discs. The discs are not of uniform size, holding 5.4, 8.9, 16.8, and 18.7 grams of powder each. A fifth disc, light blue in color, contains a 3.1 gram black powder ignition charge.

The propellant cases are of two designs. The newer type, designated "B" (OTSU) by the Japanese, is one piece and slips off of the projectile to change the propellant charge. An older design, presumably "A" has a threaded base which may be unscrewed to vary the charge.

Remarks: This projectile is the same as the high-explosive, type 92, used in the type 94 tank gun.

Type 92 7-cm (70-mm) Substitute Projectile

Weight of complete round: No data.
Weight of projectile fuzed: No data.
Weight of filling: No data.
Filling: Black powder.
Diameter at bourrelet: 70 mm (minus tol.).
Length of projectile (without fuze): 187 mm ($7\frac{3}{8}$ inches).
Length of propellant case: 101 mm (4 inches).
Length of assembled round (without fuze): 259 mm ($10\frac{3}{16}$ inches).
Diameter of base of case: 81 mm ($3\frac{3}{16}$ inches).
Width of rotating band: 10 mm.
Weapons in which used: Type 92 infantry gun (Howitzer).
Fuzing:
  Type 88 instantaneous nose fuze (howitzer, mortar type).
  Type 88 short-delay nose fuze (howitzer, mortar type).
Propellant: Refer to the type 92 high-explosive projectile.

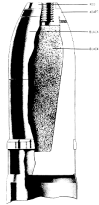


Figure 237—Type 92 7-cm Substitute Projectile.

Type 37-cm (70-mm) Hollow-Charge Projectile

Weight of complete round: No data.
Weight of projectile (without fuze): (2.80 kg.) 6 pounds, 4.75 ounces.
Weight of filling: (0.99 kg.) 1 pound.
Filling: A cast mixture of TNT and Cyclonite (RDX) wrapped in varnished paper.
Diameter at bourrelet: 69.5 mm ($2\frac{47}{64}$ inches).

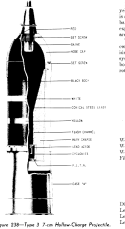


Figure 238—Type 3 7-cm Hollow-Charge Projectile.

Length over all (without fuze): 229 mm (9 inches).
Length protruding from case: 186 mm ($7\frac{19}{64}$ inches).
Length of projectile body without nose cap: 170 mm ($6\frac{45}{64}$ inches).
Width of rotating band: 10 mm.
Weapons in which used: Type 92 infantry gun (howitzer).
Fuzing: Type 88 instantaneous fuze (howitzer, mortar type). Operation and Employment: This round is used principally as an anti-tank weapon.

Remarks: The use of a white band above a yellow band to identify hollow charge projectiles is assumed to be a combination of the use of white band for armor-piercing and yellow band for high explosive in the new color system. Both bands are near the middle of the projectile.

This arrangement is not to be confused with the combination of yellow band above white band to identify high explosive projectiles in the old color system, in which case the yellow band is at the bourrelet and the white band just above the rotating band.

Type 95 7-cm (70-mm) Illuminating Projectile

Weight of complete round: 4.20 kg. (9.24 pounds).
Weight of projectile, fuzed: 3.50 kg. (7.70 pounds).
Weight of filling: No data.
Filling:

Ejection charge: Black powder.
Illuminating composition: Not known. It is probably a mixture of magnesium, aluminum, and barium nitrate which is used commonly by the Japanese for illuminating charges.

Diameter at bourrelet: 70 mm (minus tol.).
Length of projectile (without fuze): No data.
Length of propellant case: 101 mm (4 inches).
Length of assembled round (without fuze): 292 mm ($11\frac{1}{2}$ inches).
Diameter of base of case: 81 mm ($3\frac{3}{16}$ inches).
Width of rotating band: No data.
Weapons in which used: Type 92 infantry gun (howitzer).
Fuzing: Type 89 small time fuze.

Propellant: 0.6-mm square flakes (50 grams). Either of the propellant cases discussed for the H. E. round may be used for this round.

Remarks: The illuminating charge burns for approximately 20 seconds with an intensity of about 90,000 candlepower.

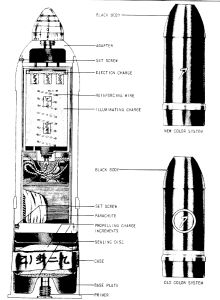


Figure 239—Type 95 7-cm Illuminating Projectile.

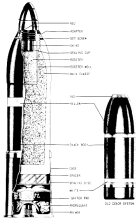


Figure 240—Type 92 7-cm High-Explosive Projectile.

Type 92 7-cm (70-mm) High-Explosive Projectile

Weight of complete round: 4.42 kg. (9.72 pounds).

Weight of projectile fuzed: 3.81 kg. (8.38 pounds).

Weight of filling: 0.590 kg.

Filling: Standard, cast TNT; alternate, pressed mixture of R. D. X. and ammonium nitrate.

Diameter at bourrelet: 70 mm (minus tol.).

Length of projectile (without fuze): 234 mm ($9\frac{1}{4}$ inches).

Length of propellant case: 101 mm (4 inches).

Length of assembled round (without fuze): 306 mm ($12\frac{1}{16}$ inches).

Diameter of base of case: 81 mm ($3\frac{3}{16}$ inches).

Width of rotating band: 10 mm.

Weapons in which used: Type 94 tank gun.

Fuzing: Type 88 short-delay nose fuze (gun type).

Propellant: 138 grams of 5-mm square grain (medium) smokeless powder.

Remarks: The projectile is the same as the type 92 H. E. projectile used in the Type 92 Infantry Howitzer.

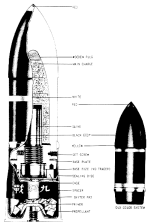


Figure 241—Type 95 7-cm Armor-Piercing Projectile.

Type 95 7-cm (70-mm) Armor-Piercing Projectile

Weight of complete round: 5.04 kg. (11.10 pounds).

Weight of projectile, fuzed: 4.45 kg. (9.80 pounds).

Weight of filling: 0.170 kg.

Filling: Preformed, paper-wrapped filling: Forward portion, "OSHIYAKU" (Picric Acid, 90 percent; paraffin, 10 percent; after portion, TNT).

Diameter at bourrelet: 70 mm (minus tol.).

Length of propellant case: 101 mm (4 inches).

Length of assembled round: 307 mm (12 1/16 inches).

Diameter of base of case: 81 mm (3 3/16 inches).

Width of rotating band: 10 mm.

Weapons in which used: Type 94 tank gun.

Fuzing: Type 95 small A. P. base fuze.

Propellant: 5 mm square grain (medium) 120 grams.

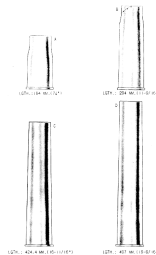


Figure 242—7-cm Introduction.

INTRODUCTION TO ARMY 7-cm (75-mm) AMMUNITION

There were ten or more 75-mm guns in use in the Japanese Army. Though the weapons vary considerably in design, length of bore, and employment, the bore diameter (75 mm) is held constant and in large part the projectiles are designed to be interchangeable for numerous guns. In this way, identical projectiles may be assembled with different sizes of case and propellant charge to fit the various weapons.

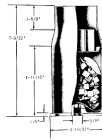
For this reason the cases and propellant charges for the different weapons will be treated separately and the projectiles will be presented as a group of designs which are potentially interchangeable for all Army 75-mm guns. The specific purpose of a given projectile or a given gun will limit the occurrence of many of the possible combinations.

Ammunition for Japanese Navy guns designated "8 cm" is comparable in size to Army 7-cm, but the Navy guns have a bore diameter of three inches (76.2 mm) and Army and Navy projectiles and ammunition are not interchangeable. Navy guns as well as Army guns are found commonly in shore defenses, but the identity of the installations, weapons, and ammunition remains distinctly Army or Navy.

CLASSIFICATION OF JAPANESE ARMY 75-MM GUNS BY SIZE OF CHAMBER (SIZE OF PROPELLANT CASE)

Size of case	Weapon	Marking on case	
A	Type 41 mountain gun (regimental gun)	四 一 山	(Rare) Written vertically
	Type 94 mountain gun	九四山	Written vertically
B	Type 38 field gun	九 改 四 三 造 五 三 一 八 八	Appears as Shown*
	Type 41 cavalry gun		
	Type 38 improved field		
	Type 95 field gun		
C	Type 11 year field/A. A. gun	野 野 騎 野 九〇	Written vertically
	Type 90 field gun		
	Type 1 self-propelled gun		
D	Type 88 field/A. A. gun	ハハ式七高	Written vertically
	Type 88 field/A. A. gun (special)	ハハ式七高 ㊕	

*For convenience in reference, this group, in which the propellant case bears the multiple designation for four weapons, will be termed "Type 38 Field Gun Group."



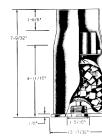
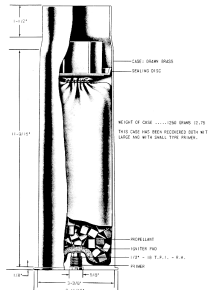


Figure 243—7-cm Propellant Cases.



WEIGHT OF CASE .....1250 GRAMS (2.75 LB

THIS CASE HAS BEEN RECOVERED BOTH WITH LARGE AND WITH SMALL TYPE PRIMER.

Figure 244—7-cm Propellant Case.

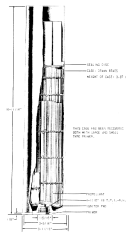


Figure 245—7-cm Propellant Case.

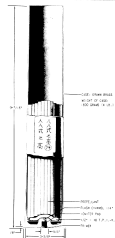


Figure 246—7-cm Propellant Case.

ARMY 7-CM (75-MM) COMPLETE ROUNDS

Projectile	Propellant charge used for various guns						
	Type 41 mountain	Type 94 mountain	Type 38 group	Type 90 field	Type 88 field-AA	Type 88 special	Type 11 year field-AA
H. E. A. A. (?)	----------	----------	----------	----------	----------	----------	Mk 1 Flat Strip 600 g.
H. E. A. A. (L. P.) Type 90.	----------	----------	----------	----------	(Sing. perf. cyl. sticks 1474 g.)	Mk 3 Flat Strip 390 g.	Mk 1 Flat Strip 600 g.
H. E. (L. P.) Type 90	----------	No data	Mk 1 Flat Strip 600 g.	Mk 3 Med. Flat Strip 200 g.	----------	Mk 2 Flat Strip 260 g.	----------
H. E. Type 94	Mk 1 Sq. Grain 265 g.	Sq. Grain 492 g.	Mk 1 Flat Strip 600 g.	Mk 1 Flat Strip 655 g.	----------	Mk 1 Flat Strip 675 g.	----------
H. E. Design "A"	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Flat Strip 600 g.	----------	----------	----------	----------
H. E. Design "B"	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Flat Strip 600 g.	----------	----------	----------	----------
H. E. (conv't'd) Type 98 (Modif).	No data	----------	No data	----------	----------	----------	----------
H. E. Semi-St. Type 90.	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Flat Strip 600 g.	No data	----------	----------	----------
H. E. Semi-St. Type Undet.	Mk 1 Sq. Grain 265 g.	No data	----------	----------	----------	----------	----------
Hollow Charge Type 2.	(Sq. Grain 227 g.).	No data	----------	----------	----------	----------	----------
A. P. H. E. Type 95	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Flat Strip 600 g.	No data	----------	----------	----------
A. P. Type Undet	Mk 1 Sq. Grain 265 g.	No data	----------	----------	----------	----------	----------
Shrapnel Type 38	Mk 1 Sq. Grain 255 g.	No data	Mk 1 Flat Strip 600 g.	Mk 1 Flat Strip 655 g.	----------	No data	----------

ARMY 7-CM (75-MM) COMPLETE ROUNDS—Continued

Projectile	Propellant charge used for various guns						
	Type 41 mountain	Type 94 mountain	Type 38 group	Type 90 field	Type 88 field-AA	Type 88 special	Type 11 year field-AA
Shrapnel Type 90	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Flat Strip 600 g.	Mk 1 Flat Strip 655 g.	----------	----------	----------
Smoke (W. P.) Type Undet.	----------	----------	----------	----------	----------	----------	----------
Smoke (W. P.) Type 90.	Mk 1 Sq. Grain 265 g.	(Sq. Grain 320 g.)	Mk 1 Flat Strip 600 g.	Mk 1 Flat Strip 655 g.	----------	----------	----------
Incendiary (Non-liquid) Type 90.	No data	No data	No data	No data	----------	----------	----------
Illuminating Type 90	Mk 1 Sq. Grain 265 g.	No data	Mk 1 Med. Flat Strip 410 g.	Mk 1 Med. Flat Strip 435 g.	----------	No data	----------
Target Type 11Yr (?)	----------	----------	----------	----------	No data	----------	Mk 1 Med. Sq. Grain 160g.
Incendiary (Liquid) Type Undet.	(Sq. Grain 265 g.).	----------	----------	----------	----------	----------	----------
Vomit Gas Type Undet.	No data	No data	----------	----------	----------	----------	----------

KEY: Blank signifies that the indicated combination of projectile and propellant case has neither been recovered nor found listed in Japanese documents.

"No data" indicates that this combination is listed in documents or has been recovered, but that no information on the propellant is available.

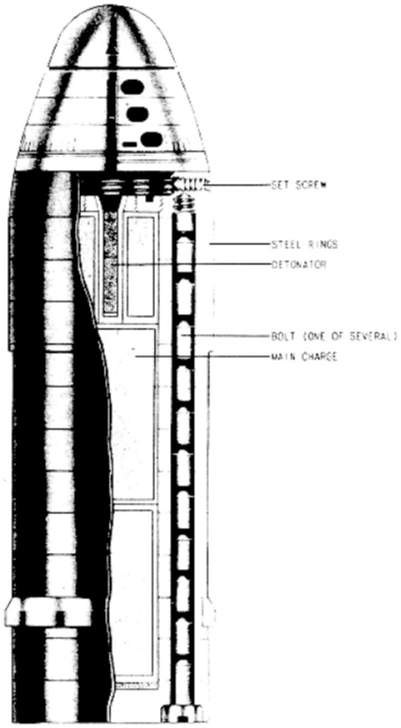


Figure 247—7-cm High-Explosive Antiaircraft Projectile.

7-cm (75-mm) H. E.–A. A. Projectile

Note.—The drawing given here is based on a Japanese drawing labelled only "Circular-layered projectile." The projectile is of apparent 75-mm size and the body appears to be made up of numerous steel rings bolted together with several bolts which are grooved at intervals to produce better fragmentation.

This projectile is believed to be the same referred to in other documents as "H. E.-A. A. Projectile" for the type 11th-year field A. A. gun. The following applies only if this presumption is correct.

Weight of projectile, filled (fuzed): 6.60 kg. (14.52 pounds).

Filling: "ONA," a mixture of picric acid and dinitronaphthalene.

Fuzing: Type 10-year A. A. powder time fuze.

Weapons in which used: Type 11-year field A. A. gun.

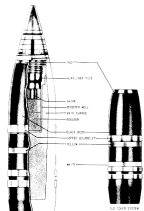


Figure 248—Type 90 7-cm High-Explosive Antiaircraft Long-Pointed Projectile.

Type 90 7-cm (75-mm) H. E.–A. A. Long-Pointed Projectile

Weight of projectile, filled (TNT): 6.53 kg. (14.37 pounds).
Weight of filling: 0.385 kg. (0.85 pound).
Filling: Standard, TNT cast directly into lacquered cavity (recovered); alternate, picric acid (documentary evidence).
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 257 mm ($10\frac{1}{8}$ inches).
Length projecting from case: 202 mm ($7\frac{15}{16}$ inches).
Width of forward rotating band: 9.5 mm.
Width of after rotating band: 9.5 mm.
Width of space between rotating bands: 6.5 mm.
Width of copper bourrelet: 14 mm.
Distance from base to after edge of bourrelet: 140 mm.
Fuzing: Type 89 long-pointed powder time fuze in nose. An auxiliary fuze armed by setback and centrifugal force is used immediately below the time fuze.

Weapons in which used:

- Type 11th-year 7.5-cm field A. A. gun.
- Type 88 7-cm field A. A. gun, case, 19$\frac{9}{16}$ inches.
- Type 88 7-cm field A. A. gun (special), case, 19$\frac{9}{16}$ inches.

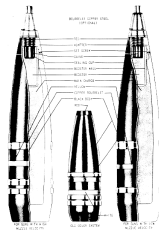


Figure 249—Type 90 7-cm High-Explosive Long-Pointed Projectile.

Type 90 7-cm (75-mm) H. E. Long-Pointed Projectile

Weight of Projectile, Filled (without fuze) (TNT): 6.17 kg. (13.62 pounds).
Weight of filling: 0.49 kg. (1.08 pounds).
Filling:
  Standard, TNT cast directly into a lacquered cavity (documentary).
  Alternate, "HEINEI" trinitrophenetole (recovered).

Indicated by 平寧 painted on body.

Diameter at bourrelet: 75.0 mm (minus tol.).
Length over all (without fuze): 317.5 mm (12½ inches).
Length protruding from case: 267.0 mm (10½ inches).
Width of rotating bands:
  Upper: 10.6 mm.
  Lower: 9.6 mm.
Fuzing:
  Type 88 instantaneous (gun).
  Type 88 delay (gun).

Operation and employment: It is believed this projectile was designed primarily to adapt the type 88, 75 mm, high velocity A. A. gun to a dual-purpose field gun (i. e., for air and ground targets). The ballistic form of this projectile approximates that of the type 90 long-pointed A. A. projectile, when the A. A. time fuze is installed. The projectile is also used for other weapons, as shown below.

Weapons in Which Used.
  Type 88 field A. A. (special), case, 19 9/16 inches.
  Type 38 field gun group (four weapons), case, 11 9/16 inches.
  Type 90 field gun, case, 16 11/16 inches.
  Type 94 mountain gun.

Remarks: When this projectile is cased for use in the type 88 field A. A. gun (special), a reduced propelling charge is used. This reduced charge is indicated by a Roman numeral II stenciled on the case.

Type 94 7-cm (75-mm) High-Explosive Projectile

Weight of projectile, filled (TNT): 6.02 kg. (13.24 pounds).
Weight of filling: 0.81 kg. (1.78 pounds).
Filling:
  Standard, TNT cast directly into lacquered cavity.
  Alternate, (1) "ANGA" (ammonium nitrate, RDX). 安瓦
  Alternate, (2) "HEINEI" (trinitrophenetole). 平寧

Diameter at bourrelet: 75 mm (minus tol.).
Length over-all (without fuze): 303 mm (11 15/16 inches).
Length protruding from case: 264 mm (10⅜ inches).
Width of rotating band: 10 mm.

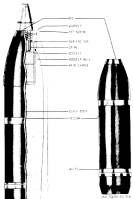


Figure 250—Type 94 7-cm High-Explosive Projectile.

Fuzing: Type 88 instantaneous nose fuze (gun type); type 88 short-delay nose fuze (gun type).

Weapons in which used:

Type 41 mountain gun (regimental gun): Case, 7¼ inches.

Type 94 mountain gun: Case $11\frac{9}{16}$ inches.

Type 38 field gun group: Case, $11\frac{9}{16}$ inches.

Type 88 field A. A. gun: Case, $19\frac{9}{16}$ inches.

Type 88 field A. A. (special) gun: Case $19\frac{9}{16}$ inches.

Type 90 field gun: Case, $16\frac{11}{16}$ inches.

Remarks: Two other designs essentially the same as the type 94 are known:

1. H. E., type 10 year.
2. H. E., type 90.

These have the same over-all length as the type 94, and have the same external form and general construction except for the following features:

1. The explosive cavity does not taper in the base as in the type 94, but is straight-sided.

2. The slight boat-tail present on the type 94 is absent in the other designs.

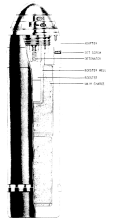


Figure 251—7-cm Design "A" High-Explosive Projectile.

3. Below the rotating band in the type 10-year design only, there is an annular groove into which the case is crimped.

7-cm (75-mm) Design "A" High-Explosive Projectile

Weight of projectile, filled: 6.46 kg. (14.2 pounds).
Weight of filling: 0.625 kg. (1.38 pound).
Filling: "ŌNA", a mixture of picric acid and dinitronaphthalene, in two preformed blocks.
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): No data.
Length protruding from case: No data.
Width of rotating band: No data.
Fuzing: Type 3d-year combination time and impact fuze.
Weapons in which used:
    Type 41 mountain gun (regimental gun): Case, 7¼ inches.
    Type 94 mountain gun: Case, 11 9/16 inches.
    Type 38 field gun group: Case, 11 9/16 inches.

Remarks: This is an old projectile and is now obsolete.

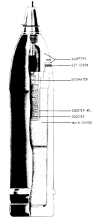


Figure 252—7-cm Design "B" High-Explosive Projectile.

7-cm (75-mm) Design "B" High-Explosive Projectile

Weight of projectile, filled: 6.61 kg. (14.5 pounds).
Weight of filling: 1.24 pounds.
Filling: "ŌNA", a mixture of picric acid and dinitronaphthalene in two preformed blocks wrapped as a single unit.
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 12⅜ inches.
Length protruding from case (without fuze): 10⅜ inches.
Width of rotating band: No data.
Fuzing: Type 88, instantaneous nose fuze (gui type); type 88, short-delay nose fuze (gun type).
Weapons in which used:

- Type 41 mountain gun (regimental gun): Case, 7¼ inches.
- Type 94 mountain gun: Case, 11⁹⁄₁₆ inches.
- Type 38 field gun group: Case, 11⁹⁄₁₆ inches.

Remarks: This is an old projectile and is now obsolete.

Type 98 Modified 7-cm (75-mm) High-Explosive Projectile

Weight of projectile, filled: 4.5 kg. (9.9 pounds).

Weight of filling: 0.95 kg. (2.1 pounds).

Filling: TNT cast directly into lacquered cavity.

Diameter at bourrelet: 75 mm (minus tol.).

Length over all (without fuze): 279 mm (11 inches).

Length protruding from case: 240 mm (9½ inches).

Width of rotating band: 10 mm.

Fuzing: Type 88 instantaneous nose fuze (gun type); type 88 short-delay nose fuze (gun type).

Weapons in which used:

- Type 41 mountain gun (regimental gun): Case, 7¼ inches.
- Type 38 field gun group: Case, 11 5/16 inches.

Remarks: The body of this projectile was designed for use as a shrapnel projectile employing a large combination fuze. In the converted form, the projectile is filled with TNT instead of

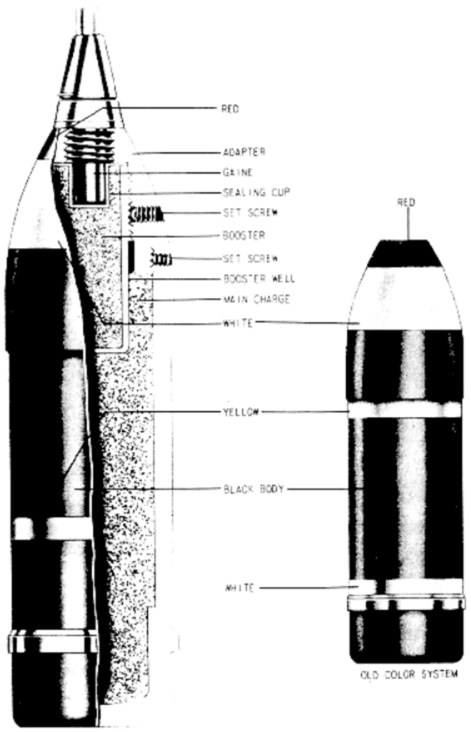


Figure 253—Type 98 Modified 7-cm High-Explosive Projectile.

the shrapnel filling of lead balls, and a large ogival adapter permits the use of standard point-detonating fuzes and a standard H. E. booster.

Distinctive marking for this projectile is attained by painting the large adapter white.

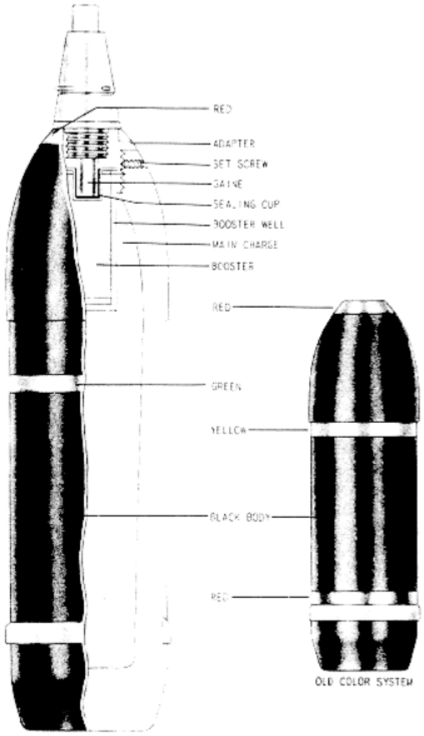


Figure 254—Type 90 7-cm High-Explosive Semisteel Projectile.

Type 90 7-cm (75-mm) High-Explosive Semisteel Projectile

Weight of projectile, filled: 6.18 kg. (13.7 pounds).

Weight of filling: 0.42 kg. (0.92 pound).

Filling: Cast TNT.

Diameter at bourrelet: 75 mm (minus tol.).

Length over all (without fuze): No data.

Length protruding from case (without fuze): 253 mm ($9\frac{15}{16}$ inches).

Width of rotating band: 10 mm.

Fuzing: Type 88 instantaneous nose fuze (gun type); type 88 short-delay nose fuze (gun type).

Weapons in which used:
  Type 41 mountain gun (regimental gun): Case, 7¼ inches.
  Type 94 mountain gun: Case, 11⁹⁄₁₆ inches.
  Type 38 field gun group: Case, 11⁹⁄₁₆ inches.
  Type 90 field gun: Case, 16¹¹⁄₁₆ inches.

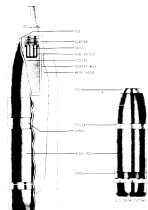


Figure 255—Type 97 7-cm High-Explosive Semisteel Projectile.

Type 97 7-cm (75-mm) H. E. Semisteel Projectile

Weight of projectile, filled: 5.5 kg. (12.1 pounds).
Weight of filling: 0.45 kg. (0.99 pound).
Filling: TNT cast directly into lacquered cavity.
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 302 mm (11⅞ inches).
Length protruding from case (without fuze): No data.
Width of rotating band: 10 mm.
Fuzing: Type 88 instantaneous nose fuze (gun type); Type 88 short-delay nose fuze (gun type).

Weapons in which used:

Type 41 mountain gun: Case, 7¼ inches.

Remarks: Because of the low tensile strength of the steel employed, the base must be extremely thick to withstand the forces in the gun.

Type 90"A" 7-cm (75-mm) Substitute Projectile

Weight of projectile, filled: 6.92 kg. (15.25 pounds).
Weight of filling: 0.10 kg.

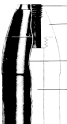


Figure 256—Type 90 "A" 7-cm Substitute Projectile.

Filling: Black powder.
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 256 mm ($10\frac{1}{16}$ inches).
Length protruding from case (without fuze): 218 mm ($8\frac{9}{16}$ inches).
Width of rotating band: 10 mm.
Fuzing: Type 88 instantaneous nose fuze (gun type); type 88 short-delay nose fuze (gun type).
Weapons in which used:
  Type 41 mountain gun (regimental gun): Case, 7¼ inches.
  Type 94 mountain gun: Case, $11\frac{3}{16}$ inches.
  Type 38 field gun group: Case, $11\frac{9}{16}$ inches.
  Type 90 field gun: Case, $16\frac{11}{16}$ inches.

Remarks: This projectile is made of cast iron and has very thick walls.

Type 2 7-cm (75-mm) Hollow-Charge Projectile

Weight of projectile, filled (without fuze): 3.56 kg. (7.81 pounds).
Weight of filling: 0.50 kg. (1.11 pounds).
Filling: A cast mixture of 60 percent TNT and 40 percent cyclonite (RDX) wrapped in varnished paper.
Diameter at bourrelet: 75.0 mm (minus tol.).
Length over all (without fuze): 240.0 mm (9½ inches).
Length protruding from case: 210 mm (8¼ inches).
Length of projectile body (without nose cap): 183.0 mm ($7\frac{3}{16}$ inches).
Width of rotating band: 10.0 mm.
Fuzing: Type 88 instantaneous (gun type).
Operation and Employment: This round is used principally as an antitank weapon. In firing tests it penetrated 3 inches of Navy hull plate (Headquarters USAFISPA, Office of the A. C. of S., G–2 Ordnance Intelligence Unit Report No. 41, entitled "Firing Tests of Japanese Antitank Weapons").
Weapons in which used:
  Type 94 mountain gun: Case, $11\frac{9}{16}$ inches.
  Type 41 mountain gun: Case, 7¼ inches.

Remarks: 1. There is a marked similarity between this projectile and German hollow-charge rounds, both in projectile design and in explosive filling.

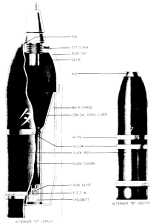


Figure 257—Type 2 7-cm Hollow-Charge Projectile.

2. The symbol **TA** stenciled on this projectile is employed in other Japanese munitions to indicate hollow-charge design.

3. In the earliest rounds found, the projectiles were marked by a yellow band around the middle of the body, indicating "High-Explosive" according to the new color system. Later recoveries indicate the adoption of the combination of white band, used to indicate "Armor-Piercing," together with the yellow band. Both bands appear near the middle of the body. This arrangement is not to be confused with the use, in the old color system, of a yellow band above a white band for marking "High-Explosive" projectiles.

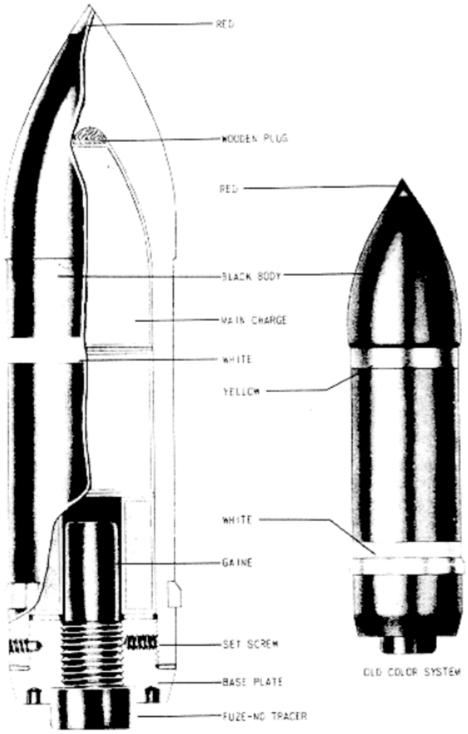


Figure 258—Type 95 7-cm Armor-Piercing High-Explosive Projectile.

Type 95 7-cm (75-mm) Armor-Piercing High-Explosive Projectile

Weight of projectile, filled (fuzed): 6.21 kg. (13.66 pounds).
Weight of filling: 0.46 kg. (1.01 pounds).
Filling: "ŌNA" a mixture of picric acid and dinitronaphthalene.
Diameter at bourrelet: 75.0 mm (minus tol.).
Length over all (without fuze): No data.
Length protruding from case: 265.5 mm (10 7/16 inches).
Width of rotating band: No data.
Fuzing: Type 95 small base fuze.
Weapons in which used:
- Type 41 mountain gun (regimental gun): Case, 7¼ inches.
- Type 38 field gun group: Case, 11 9/16 inches.
- Type 90 field gun: Case, 16 11/16 inches.
- Type 94 mountain gun: Case, 11 9/16 inches.
- Type 88 7 cm field A. A. gun (special): Case, 19 9/16 inches.

Penetrating power: When used in the type 41 mountain gun this projectile is designed to pene-

trate 20 mm of steel plate at a maximum range of 3,000 meters.

Remarks: By design, this projectile is intended for a function intermediate between that of H. E. projectiles and true armor-piercing types. For this reason the Japanese designate it "A. P.-H. E." A. P.-H. E. projectiles are painted like the H. E. rather than the A. P. class.

Type 1 7-cm (75-mm) Armor-Piercing Projectile

Weight of projectile, filled (fused): 6.56 kg. (14.4 pounds).
Weight of projectile, empty (without fuze and gaine): 6.14 kg. (13.5 pounds).
Weight of filling: 0.053 kg. (0.12 pounds).
Filling: A mixture of 90 percent cyclonite (R D X) and 10 percent paraffin, coated with graphite and packed in an aluminum foil wrapper.

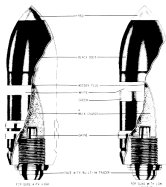


Figure 259—Type 1 7-cm Armor-Piercing Projectile.

Diameter at bourrelet: 75.0 mm (minus tol.).
Length over all (without fuze): 240.0 mm (9 7/16 inches).
Length protruding from case: 200.0 mm (7 13/16 inches).
Width of rotating band: 10.0 mm.
Fuzing: Medium Mk I base fuze (short delay) with red tracer.
Operation and employment: This projectile was evidently developed to adapt the type 41 and type 94 guns for use as antitank weapons.
Weapons in which used:
    Type 94 mountain gun: Case, 11 9/16 inches.
    Type 41 mountain or regimental gun: Case, 7¼ inches.
    Type 90 field gun: Case, 16 11/16 inches.
    Type 38 field gun group: Case, 11 9/16 inches.

Remarks: Identical projectiles, all with tracer, have been found marked with either a single white band near the middle of the body or with white-and-green double band (green in conjunction with another band indicates presence of tracer). It is believed that this represents optional marking in the new system rather than old and new marking.

Type 38 7-cm (75-mm) Shrapnel Projectile

Weight of projectile: 6.83 kg. (15.0 pounds).
Bursting charge: 0.10 kg. (0.22 pound). Black powder contained in the base of the projectile and in a central brass tube.
Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 250 mm (9¾ inches).
Length protruding from case (without fuze): 188 mm (7⅜ inches).
Width of rotating band: No data.
Fuzing:
    Type 3d year combination time and·impact fuze.
    Type 5th year combination time and impact fuze.
Weapons in which used:
    Type 41 mountain gun (regimental gun): Case, 7¼ inches.
    Type 94 mountain gun: Case, 11 9/16 inches.
    Type 38 field gun group: Case ,11 9/16 inches.
    Type 90 field gun: Case, 16 11/16 inches.

Remarks: All guns except type 90 field gun and type 94 mountain gun use the type 3d year fuze in this projectile. Type 90 field gun uses type 5th year fuze only; type 94 mountain gun uses either fuze.

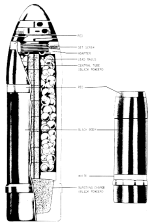


Figure 260—Type 38 7-cm Shrapnel Projectile.

Type 90 7-cm (75-mm) Shrapnel Projectile

Weight of projectile, filled: 7.00 kg. (15.4 pounds).
Bursting charge: 0.100 kg. (0.22 pound). Black powder contained in base of the projectile and in a central brass tube.
Shrapnel filling: Approximately 272 lead balls (10.5 grams each) packed in a rosin matrix. The balls are separated from the bursting charge in the base by a steel disk which rests on a shoulder in the projectile cavity.

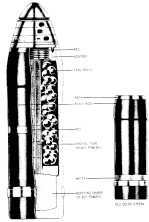


Figure 261—Type 90 7-cm Shrapnel Projectile.

Diameter at bourrelet: 75 mm (minus tol.).
Length over all (without fuze): 235 mm (9¼ inches).
Length protruding from case (without fuze): 197 mm (7¾ inches).
Width of rotating band: 10 mm.
Fuzing: Type 5th year combination time and impact fuze.

Weapons in which used:

Type 41 mountain gun (regimental gun): Case, 7¼ inches.

Type 94 mountain gun: Case, 11⁹⁄₁₆ inches.

Type 38 field gun group: Case, 11⁹⁄₁₆ inches.

Type 90 field gun: Case, 16⁹⁄₁₆ inches.

7-cm (75-mm) Smoke (W. P.) Projectile

Weight of projectile, filled: No data.

Weight of bursting charge: No data.

Bursting charges: Black powder in base of projectile. Filling of central exploder tube is probably also black powder.

Chemical agent: White phosphorus in a sealed can which slips into the cavity of the projectile and through which passes the exploder tube.

Diameter at bourrelet: 75 mm (minus tol.).

Length over all (without fuze): No data.

Length protruding from case (without fuze): No data.

Width of rotating band: No data.

Fuzing: Type 3d year combination time and impact fuze.

Remarks: This projectile appears to be a converted type 90 shrapnel projectile.

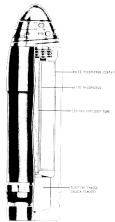


Figure 262—7-cm Smoke (W. P.) Projectile.

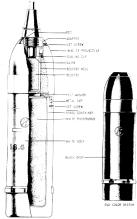


Figure 263—Type 90 7-cm Smoke (W. P.) Projectile.

Type 90 7-cm (75-mm) Smoke (W. P.) Projectile

Weight of projectile, filled: 5.72 kg. (12.60 pounds).

Bursting charge: 0.10 kg. (0.22 pound). "ŌNA", a 50-50 mixture of picric acid and dinitronaphthalene in a preformed, paper-wrapped block.

Chemical agent: 700 grams. White phosphorus sealed in a soldered brass can which fits into the lacquered cavity below the bursting charge.

Diameter at bourrelet: 75 mm (minus tol.).

Length over all (without fuze): 292 mm ($11\frac{1}{2}$ inches).
Length projecting from case (without fuze) 253 mm (10 inches).
Width of rotating band: 10 mm.
Fuzing: Type 88 instantaneous nose fuze (gun type).
Weapons in which used:
  Type 41 mountain gun (regimental gun): Case, $7\frac{1}{4}$ inches.
  Type 94 mountain gun: Case, $11\frac{9}{16}$ inches.
  Type 38 field gun group: Case, $11\frac{9}{16}$ inches.
  Type 90 field gun: Case, $16\frac{11}{16}$ inches.

Screening capacity (Japanese figures): ケ
  Height, 20 meters.
  Width, 20 meters.
  Duration, 1 to 2 minutes.

Type 90 7-cm (75-mm) Incendiary Projectile

Weight of projectile, filled (with fuze): 6.94 kg. (15.3 pounds).
Weight of expelling charge: 20 grams.
Weight of incendiary composition: 530 grams.
Expelling charge: Black powder.
Incendiary composition: Not determined.
Diameter at bourrelet: 75 mm (minus tol.).
Length of projectile (without fuze): No data.
Length protruding from case (without fuze): 213 mm ($8\frac{3}{8}$ inches.)
Width of rotating band: No data.
Fuzing: Type 5th year modified combination fuze (gun).
Weapons in which used:
  Type 41 mountain gun: Case, $7\frac{1}{4}$ inches.
  Type 94 mountain Gun: Case, $11\frac{9}{16}$ inches.
  Type 38 field gun group: Case, $11\frac{9}{16}$ inches.
  Type 90 field gun: Case, $16\frac{11}{16}$ inches.

Operation: After a preset time or on impact, the combination fuze fires the expelling charge. This forces the incendiary unit out the base of the projectile and at the same time ignites it. Information pertaining to the incendiary unit is lacking, but the burning compound is apparently a dry composition.

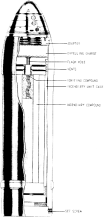


Figure 264—Type 90 7-cm Incendiary Projectile

Remarks: According to the new marking system, this projectile is painted as follows: Yellow body with the symbol ㋳ stenciled near the middle.

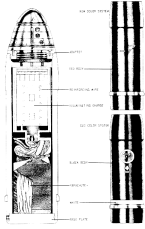


Figure 265—Type 90 7-cm Illuminating Projectile.

Type 90 7-cm (75-mm) Illuminating Projectile

Weight of projectile, filled (fuzed): 5.65 kg. (12.44 pounds).

Weight of illuminating compound: 0.25 kg. (0.55 pound).

Filling:
  Expelling charge, black powder.
  Illuminating compound, not known. (A common illuminating compound used by the Japanese is a mixture of barium nitrate, magnesium and aluminum.)

Diameter at bourrelet: 75.0 mm (minus tol.).

Length over all (without fuze): No data.

Length protruding from case: 210.0 mm (8¼ inches).

Width of rotating band: No data.

Fuzing: Type 5th year combination fuze.

Weapons in which used:
  Type 41 mountain gun: Case, 7¼ inches.
  Type 38 field gun group: Case, 11 9/16 inches.
  Type 90 field gun: Case, 16 11/16 inches.
  Type 94 mountain gun: Case, 11 9/16 inches.

Remarks: 1. Japanese figures state that this illuminating charge burns with an intensity of approximately 90,000 candlepower, for a period of 20 seconds.

2. According to the new marking system, this projectile is painted as follows: Red body with the symbol Ⓣ stenciled near the middle. Under the old marking system, it was painted black over all with the same symbol stenciled on the body.

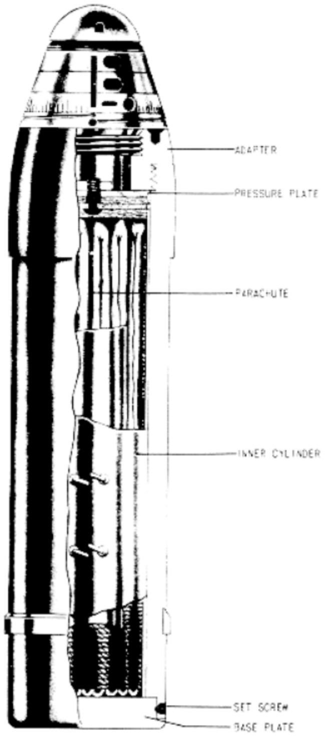


Figure 266—Type 11-Yr. 7-cm Target Projectile.

Type 11 Year 7-cm (75-mm) Target Projectile

Weight of projectile, filled (fuzed): 5.04 kg. (11.10 pounds).
Filling: Folded parachute and shrouds in cardboard cylinder.
Diameter at bourrelet: 75.0 mm (minus tol.).
Length over-all (without fuze): 271 mm ($10\frac{11}{16}$ inches).
Length protruding from case: No data.
Width of rotating band: 10 mm.
Fuzing: Type 10th year A. A. time (weak).
Weapons in which used:
    Type 11-year field A. A. gun: Case length not known.
    Type 88 field A. A. gun: Case, $19\frac{9}{16}$ inches.

Remarks: Projectiles designated "Target" in Japanese Army nomenclature are believed to be actual parachute-suspended aerial targets for antiaircraft practice. The drawing and the data given here are from captured documents. Though operation was not described, it is presumed that the time fuze ejects the parachute at the desired altitude and that the projectile body remains attached as a weight. The descending parachute then serves as a target for A. A. fire. No ejection charge other than the magazine charge in the fuze is indicated in the document, and the fuze is designated as "weak." It is assumed that this arrangement is intended to decrease the force of explosion to the minimum necessary to eject the parachute.

Color marking: Black body, no color bands, the symbol ㋢ stencilled near the middle of the body.

7-cm (75-mm) Liquid Incendiary Projectile

Weight of projectile, filled (fuzed): 5.36 kg. (11.75 pounds).
Bursting charge: A standard 40-gram booster (fine granular picric acid in paper container) serves as the only bursting charge.
Incendiary filling: A solution of white phosphorus (W. P.) and rubber pellets in carbon disulphide (CS_2).
    Liquid: 0.30 kg. (0.66 pound).
    Rubber pellets: 0.32 kg. (0.70 pound).
Diameter at bourrelet: 75 mm (minus tol.).
Length over-all without fuze and adapter: 300 mm ($11\frac{13}{16}$ inches).

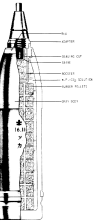


Figure 267—7-cm Liquid Incendiary Projectile.

Length protruding from case: 242 mm (9½ inches).
Width of rotating band: 10 mm.
Fuzing: Type 88 instantaneous fuze (gun type).
Weapons in which used:
  Type 41 mountain gun or regimental gun: Case, 7¼ inches.
  Type 94 mountain gun: Case, 11⁹⁄₁₆ inches.
  Type 38 field gun group: Case, 11⁹⁄₁₆ inches.
  Type 90 field gun: Case, 16¹⁵⁄₁₆ inches.

Remarks: Because of the danger of leaking phosphorus solution, these projectiles are shipped with a bag of clay-like, diatomaceous earth tied around the nose end. It is presumed that this is intended as an absorbent should leakage occur.

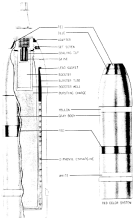


Figure 268—7-cm Vomit Gas Projectile.

7-cm (75-mm) Vomit-Gas Projectile

Weight of projectile, filled (without fuze): 6.00 kg. (13.25 pounds.)

Bursting charge. A mixture of 70 percent trinitrotoluene and 30 percent naphthalene. (Naphthalene is probably used to decrease sensitivity of TNT): 0.46 kg. (1.02 lbs.)

Liquid filling: Crude diphenylcyanarsine. 0.17 kg. (0.37 pound).

Diameter at bourrelet: 75.0 mm (minus tol.)

Length over all (without fuze): 305.0 mm (1 inches.)

Length protruding from case: 265.0 mm ($10\frac{7}{16}$ inches.)

Width of rotating band: 9.0 mm ($\frac{3}{8}$ inch.)

Fuzing: Type 88 instantaneous fuze.

Weapon in which used: Type 41 regimental or mountain gun: Case, $7\frac{1}{4}$ inch.

Type 100 8-cm (88-mm) High-Explosive–A. A. Long-Pointed Projectile

Weight of complete round: Not available.

Weight of complete projectile (with fuze): 19.6 pounds (approximate).

Weight of empty projectile (with auxiliary fuze): 7.4 kg. (16.3 pounds).

Weight of filling: 0.9 kg. (2 pounds).

Filling: TNT.

Diameter at bourrelet: 88 mm (minus tol.).

Length of projectile (without fuze): 298 mm 11 13/16 inches).

Length of propellant case: 570 mm (22 3/8 inches).

Length of assembled round (without fuze): 804 mm (31 9/16 inches).

Diameter of base of case: 100 mm (4 inches).

Width of rotating band:

- Forward: 8 mm (5/16 inch).
- Aft: 8 mm (5/16 inch).

Distance between rotating bands: 6 mm (1/4 inch).

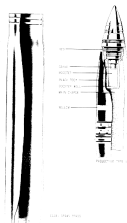


Figure 269—Type 100 8-cm High-Explosive Antiaircraft Long-Pointed Projectile.

Fuzing: Type 100 mechanical time fuze (combination time and impact) with an auxiliary detonating fuze. The auxiliary fuze is the same as that used in the 7-cm (75-mm) H. E.-A. A. projectile type 90.

Weapons in which used: Type 99 8-cm A. A. gun. This is a gun modeled after one of the German 88 mm guns.

Case:

Length: 567 mm (22⅜ inches).

Diameter at base: 137 mm (4⅜ inches).

The case is made of drawn brass and is machined for about 2¾ inches above the rim. It is a rimmed case with a slight taper and a bottleneck.

Propellant: No. 16 cylindrical, 2,330 grams (5.1 pounds.)

9-cm (90-mm) High-Explosive Projectile

Weight of projectile, filled: 7.79 kg. (17.13 pounds).

Weight of filling: 0.59 kg. (1.3 pounds).

Filling: Crude TNT.

Diameter at bourrelet: 90 mm ($3\frac{17}{32}$ inches).

Length over all (without fuze): 265.1 mm ($10\frac{7}{16}$ inches).

Length of projectile body (without nose piece): 209.6 mm (8¼ inches).

Length protruding from case (without fuze): 246.1 mm ($9\frac{11}{16}$ inches).

Width of Rotating Band: No data.

Fuzing:

Type 88 instantaneous nose fuze (howitzer-mortar type).

Type 88 short-delay nose fuze (howitzer-mortar type).

Weapon in which used: This is an antiquated weapon classified as a mortar by the Japanese by virtue of length of tube, muzzle velocity, etc., but bearing only a remote resemblance to other Japanese mortars.

It is breech-loading, using an interrupted thread breechblock, and employs projectiles embodying the conventional features of design of common breech-loading artillery pieces.

Remarks: The body of this projectile is painted black over-all. There is a shallow groove immediately below the bourrelet which may be painted yellow or green.

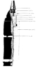


Figure 270—9-cm High-Explosive Projectile.

9-cm (90-mm) High-Explosive Semisteel Projectile

Weight of projectile, filled: 7.86 kg. (17.3 pounds).

Weight of filling: 0.65 kg. (1.42 pounds).

Filling: TNT.

Diameter at bourrelet: 90 mm ($3\frac{17}{32}$ inches).

Length over all (without fuze): 263.5 mm (10⅜ inches).

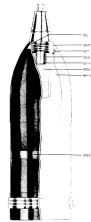


Figure 271—9-cm High-Explosive Semi-Steel Projectile.

Length protruding from case (without fuze): 246.1 mm ($9\frac{11}{16}$ inches).
Width of rotating band: 15.9 mm (⅝ inch).
Fuzing:

Type 88 instantaneous nose fuze (howitzer-mortar type).
Type 88 short delay nose fuze (howitzer-mortar type).

Weapon in which used: This is an antiquated weapon classified as a mortar by the Japanese by virtue of length of tube, muzzle velocity, etc., but bearing only a remote resemblance to other Japanese mortars. It is breech-loading, using an interrupted thread breechblock, and employing projectiles embodying the conventional features of design of common breech-loading artillery pieces.

Remarks: The projectile is painted black overall, with a ½ inch green or yellow band before the rotating band. The fuze adapter is painted red.

10-cm (105-mm) Ammunition

There are three 105-mm howitzers and four 105-mm guns in use by the Japanese Army. These guns are designated 10-cm by the Japanese but have an actual bore diameter of 105 mm.

The projectiles are in most cases interchangeable for use in all these weapons and are assembled with different size cases for use in the different weapons. Only one weapon, the type 14-year A. A. gun uses fixed ammunition, all the other weapons using semifixed ammunition.

In this section the cases and projectiles will be treated separately as was done with 75-mm ammunition.

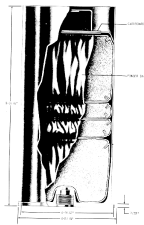


Figure 272—10-cm Ammunition.

PROPELLANT CHARGES USED FOR VARIOUS WEAPONS

Weapon	Type of propellant	Weight of propellant (kg.)	Number of increments	Weight of increments
Type 14-year howitzer	Mk 1 square grain, Mk 3 strip	0. 430	3	A 190 g. B 100 g. C 190 g.
Type 91 howitzer	Mk 2 square grain	1. 135	4	A 426 g. B 105 g. C 161 g. D 443 g.
Improved type 14-year howitzer	Mk 2 square grain	. 692	3	A 426 g. B 106 g. C 161 g
Type 92 gun	Mk 3 strip	4. 000	2	A 2.5 kg. B 1.5 kg.
Type 14-year gun	Mk 3 strip	2. 535	2	A 2.235 kg. B 0.300 kg.
Type 38 gun	Mk 2 strip	1. 740	1	1.740.
Type 14-year A. A. gun	Mk 3 strip	3. 075	1	3.075.

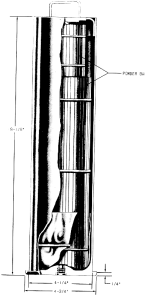


Figure 273—105-mm Type 14th-Year Gun Case.

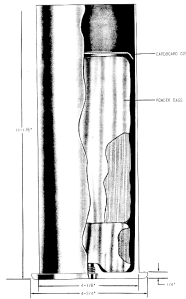


Figure 274—10-cm Ammunition.

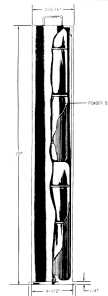


Figure 275—105-mm Type 92 Gun Case.

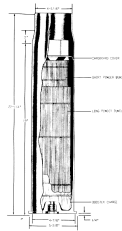


Figure 276—10-cm Ammunition.

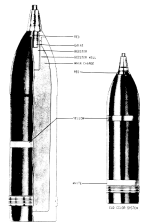


Figure 277—Type 91 10-cm High-Explosive Projectile.

Type 91 10-cm (105-mm) High-Explosive Projectile

Weight of projectile, filled (without fuze): 15.9 kg. (35.06 pounds).
Weight of filling: 2.3 kg. (5 pounds).
Filling: Cast TNT.
Diameter at bourrelet: 104 mm ($4\frac{3}{32}$ inches).
Length over all (without fuze): 427 mm ($16\frac{13}{16}$ inches).
Length protruding from case (without fuze): 389.7 mm ($15\frac{11}{32}$ inches).
Width of rotating band: 22.2 mm ($\frac{7}{8}$ inch).

Fuzing:

Type 88 instantaneous nose fuze.
Type 88 short-delay nose fuze.

Weapons in which used:

Type 91 howitzer: Case, $9\frac{1}{2}$ inches.
Type 38 field gun: Case, $11\frac{1}{8}$ inches.
Type 92 field gun: Case, 29 inches.
Type 14-year field gun: Case, $13\frac{7}{8}$ inches.

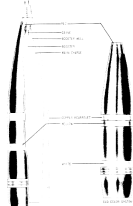


Figure 278—Type 91 10-cm High-Explosive Long-Pointed Projectile.

Type 91 10-cm (105-mm) High-Exposilve Long-Pointed Projectile

Weight of projectile, filled (without fuze): 15.7 kg. (34.5 pounds).
Weight of filling (white composition): 2.3 kg. (5.2 pounds).
Filling:
1. Cast TNT.
2. White composition of ammonium nitrate, cyclonite, and guanidine nitrate.

Diameter at copper bourrelet: 104.2 mm (4⅛ inches).
Length over all (without fuze): 501.7 mm (19¾ inches).
Length protruding from case (without fuze): 423.9 ($16\frac{11}{16}$ inches).
Width of rotating band: 22.2 mm (⅞ inch).
Width of copper bourrelet: 20.6 mm ($\frac{13}{16}$ inch).
Fuzing:
- Type 88 instantaneous nose fuze.
- Type 88 short delay nose fuze.

Weapons in which used:
- Type 91 howitzer: Case, 9½ inches.
- Type 38 field gun: Case, 11¼ inches.
- Type 14-year field gun: Case, 18¾ inches.
- Type 92 field gun: Case, 29 inches.
- Type 14-year A. A. gun (fixed ammunition): Case, 22¾ inches.

Remarks: This projectile has been recovered with either a copper or a machined bourrelet.

12-cm (120-mm) Shrapnel Projectile

Weight of projectile, filled (without fuze): 19.88 kg. (43.75 pounds).

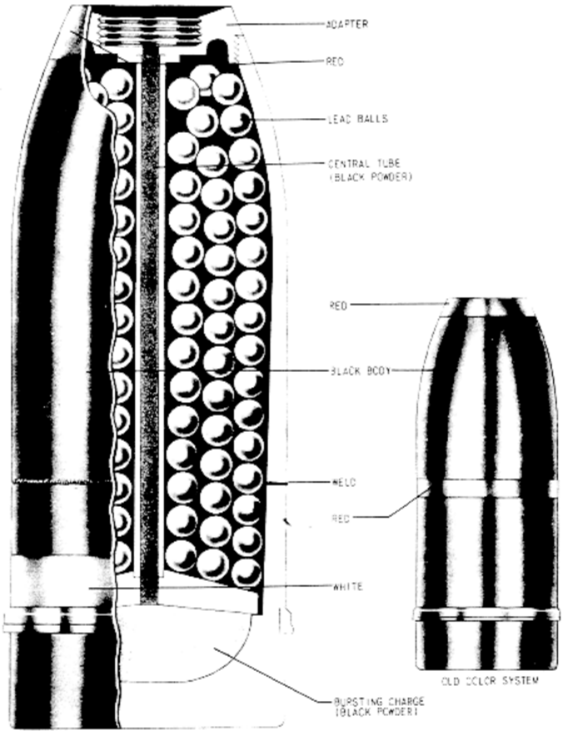


Figure 279—12 cm-Shrapnel Projectile.

Ejecting charge: Black powder contained in the base of the projectile and in a central brass tube.
Shrapnel filling: 539 lead balls (12.5 grams each) packed in a rosin matrix. The balls are separated from the ejection charge by a steel disc which rests on a shoulder in the projectile cavity.
Diameter at bourrelet: 119 mm ($4\frac{11}{16}$ inches).
Length over-all (without fuze): 314.3 mm ($12\frac{3}{8}$ inches).
Length protruding from case (without fuze): 293.1 mm ($10\frac{3}{4}$ inches).
Width of rotating band: 9.5 mm ($\frac{3}{8}$ inches).
Fuzing: Type 88 35-second combination fuze.
Weapons in which used: Type 38 howitzer.
Case:
  Length: 83 mm ($3\frac{1}{4}$ inches).
  Diameter of base: 128 mm ($5\frac{1}{8}$ inches).
  Weight (empty): 3 pounds $4\frac{5}{8}$ ounces.
  The brass case is straight sided and of the rimmed type.
Propellant: The propellant is in two increments, each encased in a silk bag with a small ignition charge sewed to the bottom of each bag. The first increment is nitrocellulose in $\frac{5}{16}$ inch square flakes and the second increment is nitrocellulose in $\frac{1}{16}$ inch square flakes.
Weight of propellant:
  1st increment: 11 ounces.
  2d increment: $6\frac{3}{8}$ ounces.

12-cm (120-mm) Armor Piercing–High-Explosive Projectile

Weight of projectile, filled (fuzed): 20 kg. (44 pounds).
Weight of filling: 1.3 kg. (2.9 pounds).
Filling: Picric acid.
Diameter at bourrelet: 119 mm ($4\frac{11}{16}$ inches).
Length over-all: 379.4 mm ($14\frac{15}{16}$ inches).
Length protruding from case: 339.7 mm ($13\frac{3}{8}$ inches).
Width of rotating band: 11.1 mm ($\frac{7}{16}$ inch).
Fuzing: Type 88 small base fuze (howitzer, mortar type).
Case: Refer to the shrapnel projectile.
Propellant: Refer to the shrapnel projectile.
Weapons in which used: Type 38 howitzer.

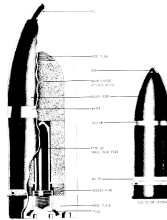


Figure 280—12-cm Armor-Piercing High-Explosive Projectile.

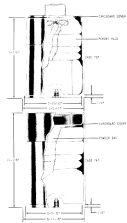


Figure 281—15-cm Ammunition.

15-cm (150-mm) Ammunition

There are three 150-mm howitzers and four 150-mm guns in use by the Japanese Army. These weapons vary greatly in design from a very short-range howitzer to long-range field guns.

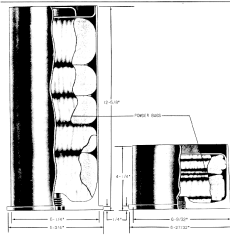
The projectiles for 150-mm ammunition are not as interchangeable as in the 75-mm or 105-mm sizes. Usually there is one type of projectile designed for use in the howitzers and another type designed for use in the guns. Even when the same projectile is used in both howitzers and guns, it will differ in that it will have a single rotating band when it is used in a howitzer, but when used in a gun it will have a double rotating band.

All the weapons with the exception of the type 89 gun, which uses a bag charge, use semifixed ammunition.

The cases and projectiles will be treated separately, as was done with 75-mm and 105-mm ammunition.

PROPELLANT CHARGES USED FOR VARIOUS WEAPONS

Weapon	Type of propellant	Weight of propellant (kg.)	Number of increments	Weight of increments
Type 4-year howitzer	Mk 2 square grain	2. 260	5	A 865 g. B 255 g. C 255 g. D 445 g. E 440 g.
Type 38 Howitzer	Mk 1 square grain	. 825	2	A 500 g. B 325 g.
Type 96 howitzer	Mk 2 square grain	2. 930	5	A 980 g. B 280 g. C 440 g. D 520 g. E 710 g.
Type 45 gun Type 7-year gun Type 90 gun	Mk 5 strip	16. 650	3	A 5.50 kg. B 5.50 kg. C 5.50 kg.
Type 89 gun	Mk 4 strip	9. 700	2	A 8.00 kg. B 1.70 kg.



TYPE 96 HOWITZER CASE

TYPE 38 HOWITZER CASE

Figure 282—150-mm Type 38 Howitzer Case.

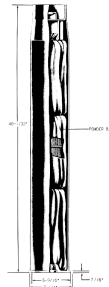


Figure 283—15-cm Ammunition.

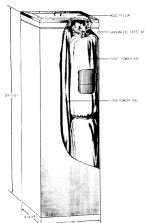


Figure 284—150-mm Powder Box.

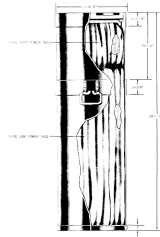


Figure 285—15-cm Ammunition.

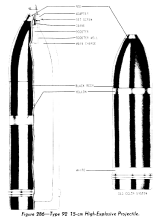


Figure 286—Type 92 15-cm High-Explosive Projectile.

Type 92 15-cm (150-mm) High-Explosive Projectile

Weight of projectile complete: 36 kg. (79.2 pounds).
Weight of filling: No data.
Filling: Angoyaku (RDX and ammonium nitrate).
Diameter at bourrelet: 149 mm ($5\frac{7}{8}$ inches).
Length over all (without fuze): 563.6 mm ($22\frac{3}{16}$ inches).
Length protruding from case (without fuze): 506.4 mm ($19\frac{15}{16}$ inches).
Width of rotating band: 20 mm ($\frac{25}{32}$ inch).

Fuzing:

Type 88 instantaneous nose fuze.
Type 88 short-delay nose fuze.

Weapons in which used:

Type 4-year howitzer, case A, $10\frac{3}{16}$ inches; case B, $8\frac{5}{8}$ inches.
Type 96 howitzer, case $12\frac{5}{8}$ inches.
Type 38 howitzer, case $4\frac{1}{4}$ inches.

Type 93 15-cm (150-mm) High-Explosive Projectile

Weight of projectile, filled (without fuze): 40.29 kg. (88.8 pounds).

Weight of filling: No data.

Filling: Cast TNT.

Diameter at copper bourrelet: 149.3 mm (5⅞ inches).

Length over all (without fuze): 593.7 mm (23⅜ inches).

Length protruding from case (without fuze): 544 mm (21⅜ inches).

Width of rotating band:
  Forward: 25.4 mm.
  Aft: 19.1 mm.

Width of copper bourrelet: 31.75 mm.

Fuzing: Type 90 instantaneous short-delay fuze.

Weapons in which used:
  Type 89 gun.
  Type 45 gun: Case, 48 1/32 inches.
  Type 7 year gun: Case, 48 5/32 inches.
  Type 90 gun: Case, 48 5/32 inches.

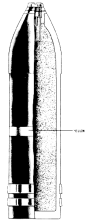


Figure 287—Type 93 15-cm High-Explosive Long-Pointed Projectile.

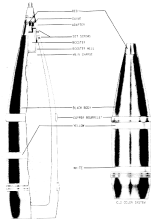


Figure 288—Type 92 15-cm High-Explosive Long-Pointed Projectile.

Type 92 15-cm (150-mm) High Explosive Long-Pointed Projectile

Weight of projectile, filled (without fuze): 30.9 kg. (68 pounds).
Weight of filling: 5.0 kg. (11 pounds).
Filling: Cast TNT.
Diameter at bourrelet: 148 mm (5 27/32 inches).
Length over all (without fuze): 581 mm (22⅞ inches).
Length protruding from case: 492.1 mm (19⅜ inches).
Width of rotating band: 14.28 mm (9/16 inch).
Width of copper bourrelet: 19.1 mm (¾ inch).

Fuzing:
- Type 88 instantaneous nose fuze.
- Type 88 short delay nose fuze.

Weapons in which used:
- Type 4-year howitzer: Case A, 10 5/16 inches; case B, 8⅜ inches.
- Type 96 howitzer: Case 12⅜ inches.
- Type 38 howitzer: Case 4¼ inches.

Type 93 15-cm (150-mm) High-Explosive Long-Pointed Projectile

Weight of projectile, filled (without fuze): 40.23 kg. (88.5 pounds).

Weight of filling: No data.

Filling: Cast TNT.

Diameter of copper bourrelet: 149.2 mm ($5\frac{7}{8}$ inches).

Length over all (without fuze): 620.2 mm ($24\frac{7}{16}$ inches).

Length protruding from case (without fuze): 516 mm ($20\frac{5}{16}$ inches).

Width of rotating band:
  Forward: 25.4 mm (1 inch).
  Aft: 19.1 mm ($\frac{3}{4}$ inch).

Width of copper bourrelet: 31.8 mm ($1\frac{1}{4}$ inches).

Fuzing: Type 90 instantaneous short-delay fuze.

Weapons in which used:
  Type 89 gun.
  Type 45 gun; Case, $48\frac{5}{32}$ inches.
  Type 7-year gun: Case, $48\frac{1}{32}$ inches.
  Type 90 gun: Case, $48\frac{5}{32}$ inches.

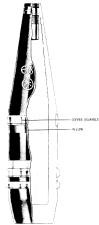


Figure 289—Type 93 15-cm High-Explosive Long-Pointed Projectile.

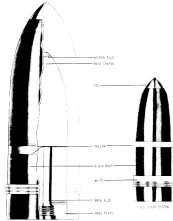


Figure 290—Type 95 15-cm Armor-Piercing High-Explosive Projectile.

Type 95 15-cm (150-mm) Armor-Piercing High-Explosive Projectile

Weight of projectile, filled (fuzed): 36.1 kg. (79.5 pounds)
Weight of filling: 2.3 kg. (5 pounds).
Filling: Two preformed blocks of high grade TNT.
Diameter at bourrelet: 150 mm (5 15/16 inches).
Length of projectile (without fuze): 449.3 mm (17 11/16 inches).
Length protruding from case: 406.4 mm (16 inches).
Width of rotating band: 20.6 mm (13/16 inch).
Fuzing: Type 95 medium howitzer-mortar base fuze.
Weapons in which used:
- Type 4-year howitzer: Case A, 10 9/16 inches; case B, 8 3/8 inches.
- Type 38 howitzer: Case, 4 1/4 inches.
- Type 96 howitzer: Case, 12 3/8 inches.
- Type 45 gun: Case, 48 1/32 inches.
- Type 7-year gun: Case, 48 1/32 inches.
- Type 90 gun: Case, 48 1/32 inches.
- Type 89 gun: Bag charge.

Remarks: When this projectile is used in a howitzer, it has a single rotating band, but when it is used in guns it has a double rotating band.

15-cm (150-mm) Armor-Piercing High-Explosive Projectile

Weight of projectile, filled: 44.54 kg. (98 pounds).
Weight of filling: 5.2 kg. (11.5 pounds).
Filling: Picric acid in two preformed, paper-wrapped blocks.
Diameter at copper bourrelet: 149.2 mm (5⅞ inches).

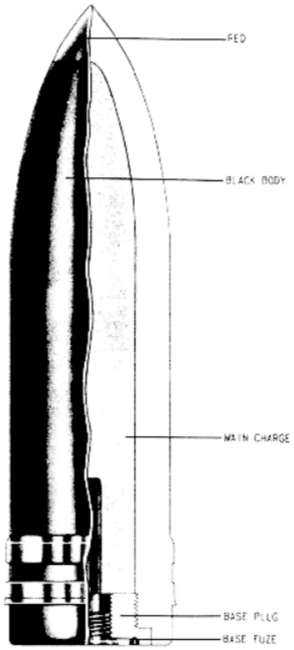


Figure 291—15-cm Armor-Piercing High-Explosive Projectile.

Length over all: 584.2 mm (23 inches).
Length protruding from case (without fuze): 544.5 mm ($21\frac{7}{16}$ inches).
Width of rotating bands:
  Forward: 25.4 mm (1 inch).
  Aft: 19.1 mm (¾ inch).
Fuzing: Type 88 small base fuze.
Weapons in which used:
  Type 89 gun.
  Type 45 gun: Case, $48\frac{1}{32}$ inches.
  Type 7-year gun: Case, $48\frac{1}{32}$ inches.
  Type 90 gun: Case, $48\frac{1}{32}$ inches.
  Type 4-year howitzer: Case A, $10\frac{9}{16}$ inches; case B, 8⅜ inches.
  Type 38 howitzer: Case, 4¼ inches.
  Type 96 howitzer: Case 12⅝ inches.

Remarks: When this projectile is used in a howitzer, it has a single rotating band; but when it is used in guns it has a double rotating band.

Type 13-Year Smoke (W. P.) Projectile

Weight of projectile, filled (without fuze): 33.63 kg. (74.25 pounds).
Bursting charge (cast picric acid): 1 kg. (2.2 pounds).
Chemical agent: 3.62 kg. (8 pounds).
  W. P. is contained in a brass cylinder fitted below the bursting charge. To prevent movement within the projectile, the container is surrounded by wax.
Diameter at bourrelet: 149.2 mm (5⅞ inches).
Length over all (without fuze): 487.4 mm ($19\frac{3}{16}$ inches).
Length protruding from case (without fuze): 471.5 mm ($18\frac{9}{16}$ inches).
Width of rotating band: 15.0 mm ($\frac{19}{32}$ inch).
Fuzing: Type 88 instantaneous nose fuze (howitzer, mortar).

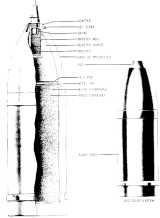


Figure 292—Type 13-Year Smoke (W. P.) Projectile.

Weapons in which used:
- 4th-year type howitzer: Case A, 10 5/16 inches; case B, 8⅜ inches.
- Type 96 howitzer: Case 12⅝ inches.
- Type 38 howitzer: Case 4¼ inches.

30-cm (305-mm) Armor-Piercing High-Explosive Projectile

Weight of projectile: No data.
Weight of filling: No data.
Filling: No data.

Diameter at bourrelet: 305 mm (12 inches).
Length over all: 1,071 mm ($42\frac{11}{64}$ inches).
Length protruding from case: 1,027 mm ($40\frac{7}{16}$ inches).
Width of rotating band: 53 mm ($2\frac{1}{16}$ inches).
Fuzing: Type 95 Large Mk 2 Model 2 base fuze.
Weapons in which used: Type 7-year 30-cm howitzer.

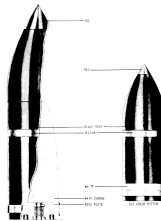


Figure 293—30-cm Armor-Piercing High-Explosive Projectile.

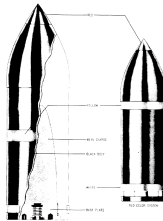


Figure 294—30-cm Armor-Piercing High-Explosive Projectile.

30-cm (305-mm) Armor-Piercing High-Explosive Projectile

Weight of projectile (approximately): 680 pounds.
Weight of filling: No data.
Filling: No data.

Diameter at bourrelet: 305 mm (12 inches).
Length over all: 1,240 mm ($48\frac{13}{16}$ inches).
Length protruding from case: 1,198 mm ($47\frac{11}{64}$ inches).
Width of rotating band: 53 mm ($2\frac{1}{16}$ inches).
Fuzing: Type 95 large Mk 2 Model 2 base fuze.
Weapons in which used: Type 7-year 30-cm howitzer.

Chapter 4—Section 2

ARMY ROCKETS

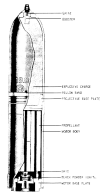


Figure 295—20-cm High-Explosive Spin-Stabilized Rocket.

20-cm H. E. Spin-Stabilized Rocket

Assembled round:
- Weight of complete round: 186.31 pounds (84.51 kg.).
- Length of complete round (with fuze): 38.58 inches.

Head:
- Weight of filled head (without fuze): 86.42 pounds.
- Weight of filling (cast TNT): 35.71 pounds (16.2 kg.).
- Length of head (without fuze): 17.52 inches.
- Diameter of head: 7.87 inches (20 cm.).

- Filling: Cast TNT, 35.71 pounds (16.2 kg.).
- Fuzing: Army type 100 mortar fuze: Selective instantaneous, short delay.
- Motor:
  - Weight of filled motor: 99.89 pounds.
  - Weight of propellant: 20.99 pounds (9.52 kg.).
  - Length of motor: 19.06 inches.
  - Diameter of bearing surface: 7.99 inches (20.3 cm).
- Propellant:
  - Type: Smokeless powder B.
  - Weight: 20.99 pounds (9.52 kg.).
  - Number of sticks: 6 long, 2 short.
  - Smokeless powder B by analysis is a mixture of 27.71 percent N. G., 63.50 percent nitrocellulose, 0.45 percent graphite, 0.34 percent ash, 3.81 percent ethylcentralite, 3.68 percent diphenyl formamide, and 1.30 percent volatiles. Six long sticks (34.0 cm. by 5.8 cm. by 1.05 cm. perf.) and two short sticks same diameter and perforation and ½ length. In some cases, one or both of the short grains have been omitted in assembly.
- Ignition mechanism:
  - Igniter: Pull friction igniter.
  - Ignition charge (B. P. in two blue lacquered silk bags).
  - Weight of ignition charge: 0.09 pound (0.04 kg.).
- Color and markings: Black over all. Head carries single yellow band at its junction with rocket motor. Weight of head and motor stenciled on each component.
- Launcher: The only launcher recovered for use with this round is a single barrel-type launcher.

Remarks: A newer model of this round has been recovered, similar to the first but with the rocket motor wall diametrically reduced to 18.9 cm. (7.44 inches), giving a bourrelet effect at each end of the motor. The motor weight is correspondingly reduced to 42.43 kg. Neither the head nor the motor is interchangeable with its respective component in the older round.

Chapter 4—Section 3

ARMY MORTARS

Type 89 58-mm H. E. Mortar

- Weight complete round: 1.6 pound.
- Weight main charge: 5.4 ounces.
- Explosive components:
  - Main charge: TNT.
  - Propellant: Nitrocellulose diphenylamine flaked powder.
- Over all length (without fuze): 4.33 inches.
- Maximum diameter: 1.97 inches (50 mm).
- Color:
  1. Black over all with red band at nose, and
     a. Yellow band below the bourrelet and white band forward of rotating band.
     b. Or, yellow band midway on the shell.
  2. Maroon color over all for Navy use.
  3. Green nose, black body with yellow and white bands.
- Fuzing: Type 88 small instantaneous fuze.
- Weapon in which used: Type 89 grenade discharger.

Description: The body of this shell is made of three parts. The propellant base housing houses the propellant container and the percussion primer. The main shell base cover is threaded to the top section on one end and to the propellant housing on the other. The top section has an opening in the top to receive the fuze.

On firing, the gases generated blow through the ports in the base housing, expanding the copper rotating band into the rifling of the discharger giving a gas seal and imparting rotation to the shell.

Remarks: The Navy version of this shell is exactly the same in construction as the Army version; the only variation being in the color scheme. Two minor variations of construction have been found.

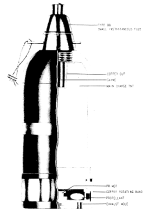


Figure 296—Type 89 58-mm High-Explosive Mortar.

1. The nose portion screws on (LH) the body directly below the bourrelet. The base is solid instead of being closed with a base plate.
2. Similar to the first variation except the threads are right hand.

Type 95 50-mm Smoke Mortar

Weight complete round: 1.9 pounds.
Weight smoke filling: 3.7 ounces.

Filler:
  Smoke compound: Hexachlorethane smoke mixture.
  Propellant: Nitrocellulose diphenylamine flaked powder.
Over all length (without fuze): 4.33 inches.
Maximum diameter: 1.97 inches (50 mm).
Color: Black over all with a red band at the nose and two white bands, one immediately below the bourrelet and the other before the rotating band.
Fuzing: Type 89 small time fuze.
Weapons in which used: Type 89 grenade discharger.

Figure 297—Type 95 50-mm Smoke Mortar.

Description: The projectile casing is of forged steel. The nose screws onto the main body at a point just behind the bourrelet. The main body is joined to the base with a press-fit held by four screw shear pins. The propellant base housing which screws onto the shell base is similar in construction and operation to that of the H. E. shell. The smoke mixture is held in a brass can inside the main body and has attached to it by a short cord a steel retarder cup to slow its descent.

Operation: When the fuze gaine fires, it ruptures the thin plate in the base of the gaine, ignites the smoke mixture, and expels the smoke candle from the shell casing.

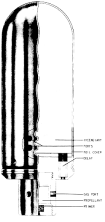


Figure 298—Type 89 50-mm Incendiary Mortar.

Type 89 50-mm Incendiary Mortar

Weight complete round: 1.25 pounds.
Weight incendiary mixture: 10.7 ounce.

Filling: Incendiary mixture:
- Potassium nitrate: 47.7 percent.
- Aluminum: 21.7 percent.
- Sulphur: 19.9 percent.
- Antimony trisulphide: 6.1 percent.
- Wax: 2.8 percent.
- Propellant: Nitrocellulose powder.

Over all length: 6.25 inches.
Length propellant containers: 1.25 inches.
Diameter propellant container: 1.02 inches.
Maximum diameter: 1.97 inches (50 mm).
Color: Natural brass body with black propellant container.
Fuzing: Powder delay train.
Weapon in which used: Type 89 grenade discharger.

Description: The shell is a cylindrical sheet-metal tube with a hemispherical nose and is covered with clear lacquer. Around the side of the casing are four silver-foil disks, each disc covering seven ports in the shell casing. The casing is crimped over the base, which contains two black-powder delay trains and is threaded to receive the propellant housing. The propellant housing is of steel, with six gas-escape ports in the sides and a percussion cap set in the screwed-in base. The propellant is contained in a copper cup inside the propellant housing.

Operation: The flash from the propellant ignites the delay trains in the base of the shell, which in turn ignite the incendiary filling.

Remarks: Another incendiary shell, the type 10-year, is similar in appearance and operation

to the type 89 shell. It is 5⅞ inches in length; the color of the body is natural brass; and the propellant assembly is black. There are eight sets of perforations covered with silver-foil disks. The type 10-year shell is fired from the type 10-year grenade discharger, an obsolete weapon that was the forerunner of the type 89 grenade discharger.

Figure 299—50-mm Finned Bangalore Torpedo.

50-mm Finned Bangalore Torpedo

Weight complete round: 17.89 pounds.
Weight main charge: 6.34 pounds.
Main charge: Picric.
Over-all length (without fuze): 78.37 inches.
Base, section length: 33.25 inches.
Length from after end of base to forward bearing surface of base section: 12.75 inches.
Maximum diameter of explosion tube: 1.97 inches (50 mm).

Fins:
  Length: 14.75 inches.
  Maximum width: 3.5 inches.
  Minimum width: 2.5 inches.

Color: Fins and bangalore section are painted tan with a red band at the top of each section. The modified portion of the base section is painted black.
Fuzing: Instantaneous delay fuze for bangalore mortar.
Weapon in which used: Type 98 discharger.

Description: The projectile is constructed in two sections. The nose section is a standard bangalore length, while the base section is a bangalore length cut off and modified to fit into the barrel of the discharger. This section also has three spot-welded brackets to which the sheet metal fins are bolted. A cap, having two circumferential grooves cut into it to divide the surface into three after bearing surfaces, is welded around the after end of the base section. A length of 50-mm tubing is welded to the base section and serves as a forward bearing surface for the projectile. A plate is welded to the bangalore base section to prevent the bangalore from sliding too far down into the launcher tube.

50-mm Stick Charges

	Small	Large
Weight complete round	15.62 pounds	17 pounds.
Weight main charge	7.0 pounds	10 pounds.
Explosive components:		
Main charge	Picric	Picric.
Propellant	Black powder	Black powder.
Over-all length	27.35 inches	25.5 inches.
Length explosive container	6.75 inches	4.5 inches.
Width explosive container	4.5 inches	6.25 inches.
Height explosive container	4.5 inches	6.25 inches.
Wall thickness	0.05 inch	0.25 inch.
Diameter of stick	1.97 inches (50 mm)	1.97 inches (50 mm).

Color: The metal explosive container is painted black, while the wooden "stick" is left unpainted. The large model has a white stripe fore and aft around the explosive box.

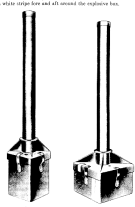


Figure 300—50-mm Stick Charges.

Weapon in which used: Type 98 discharger.
Fuzing: Two pull igniters.

Description: The projectile consists of a cast-iron box containing blocks of picric acid mounted on a wooden pole 50 mm in diameter. Two pull igniters are inserted in the bursting charge and are tied to metal loops on each side of the launcher tube collar. When the projectile is fired these pull igniters are initiated and will in turn set off the bursting charge after a short delay. The black powder propellant in silk bags is placed in the launcher tube below and independently of the projectile. The propellant is fired by a pull igniter inserted in the ignition aperture in the side of the launcher tube.

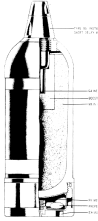


Figure 301—Type 11-Year 70-mm High-Explosive Mortar.

Type 11-Yr. 70-mm High-Explosive Mortar

Weight complete round: 4.28 pounds.
Weight main charge: 15.2 ounces.
Weight booster: 1.6 ounces.
Explosive components:
  Main charge: TNT.
  Booster: Picric.
  Propellant: Nitrocellulose diphenylamine flaked powder.
Over-all length (without fuze): 7.12 inches.
Maximum diameter: 2.75 inches (69.8 mm).
Color: Black over-all with a red band around the nose. A yellow band is painted below the bourrelet and a white band forward of the rotating band.
Fuzing: Type 93 instantaneous short delay mortar fuze.
Weapon in which used: Type 11-year 70-mm rifled mortar.

Description: This projectile is similar in construction and operation to the type 89 50-mm H. E. mortar shell.

70-mm High-Explosive–Antiaircraft Barrage Mortar

Weight complete round: 5.19 pounds.
Weight main charge (H. E. cylinders): 12.84 grams.
Explosive components:
  Main charge: RDX.
  Booster: Lead azide.
Over-all length of shell: 11.38 inches.
Maximum diameter of shell: 2.76 inches (70 mm).
Length of canisters: 6.5 inches.
Diameter of canisters: 0.75 inch.
Length of H. E. cylinders: 3.12 inches.
Diameter of H. E. cylinders: 0.69 inches.

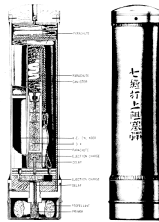


Figure 302—70-mm High-Explosive Antiaircraft Barrage Mortar.

Color: Shell, black over-all with a ⅝ inch red band at nose. Canisters, zinc coated (grey).

H. E. cylinders: Black over-all with a ³⁄₁₆ inch red band at forward end.

Weapon in which used: 70-mm A. A. barrage mortar.

Description: This mortar shell consists of an outer shell containing seven canisters in each of which is an H. E. cylinder and parachute. A turned steel base is welded to the outer shell, and provision is made for reception of a delay train holder, a shell propellant container, and an end cover. The delay train leads to a black-powder charge which ejects the canisters from the shell. The end cover is fitted over the propellant container and is sealed against moisture and held in position by adhesive tape. A wooden plug in a pressed steel cap closes the forward end of the shell.

The canisters contain a wooden plug in the base bored to receive a delay element and a small black powder charge to eject the H. E. cylinder from the canister. The steel H. E. cylinders are closed at the base and threaded at

the forward end to receive a plug into which is screwed a friction cap. The explosive content is in three blocks, each wrapped in a waterproof paper carton.

Parachutes are attached to the outer shell, nose cap, and each of the seven canisters and H. E. cylinders. The length of the parachute cords varies from 19 inches (canisters) to 66 inches (cylinders). The H. E. cylinder parachute lines are attached to a friction cord which passes through the friction cap. Thus, this shell, when fired, puts sixteen separate objects suspended by parachutes in the way of low-flying aircraft, seven of which will explode if hit.

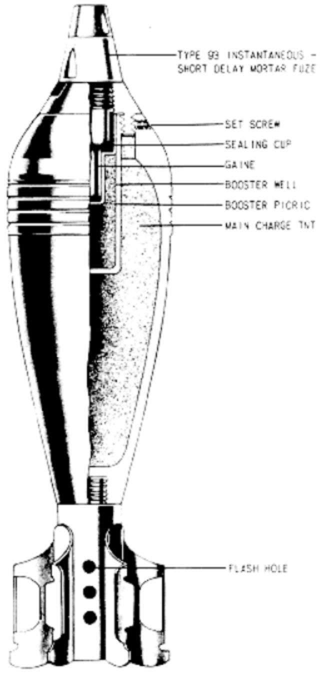


Figure 303—Type 97 81-mm High-Explosive Mortar.

Operation: The delay train to the first ejection charge is ignited by the shell propellant charge, and the first charge in turn ignites the delay trains to the second ejection charges in each of the canisters. The parachutes attached to the nose cap, outer shell, and canisters all open when the canisters are ejected and the H. E. cylinder parachutes open when they are ejected from the canisters. A plane hitting the parachute cord of any of the H. E. cylinders would cause the friction wire to be pulled through the friction cap initiating the explosive train.

Type 97 81-mm High-Explosive Mortar

Weight complete round: 7.35 pounds.
Weight main charge: 1.19 pounds.
Explosive components:
    Main charge: TNT.
    Booster: Picric.
    Propellant:
        Nitrocellulose and graphite: 58.0 percent.
        Nitroglycerine: 7.1 percent.
        Dinitrotoluene: 25.7 percent.
        Diphenylamine: 0.5 percent.
        Potassium nitrate: 8.7 percent.
Over-all length (without fuze): 11.5 inches.
Length fin assembly: 3.19 inches.
Maximum diameter at bourrelet: 3.19 inches (81 mm).
Maximum diameter tail fins: 3.19 inches.
Color: Black over-all with a red tip. A yellow band is painted before the bourrelet.
Fuzing: Type 93 instantaneous short delay mortar fuze.
Weapons in which used:
    Type 97 81-mm mortar.
    Type 99 81-mm mortar.

Description: The body is of one-piece streamlined construction having a threaded opening in the nose to receive the fuze-adapter ring. A steel booster cup screws (L. H.) into the lower end of the adapter ring. The booster cup is closed by a shaped aluminum container which receives the gaine of the fuze. The bourrelet is well machined and has four grooves cut in it.

The fin assembly screws into a female threaded (R. H.) opening in the base of the body. It con-

sists of a male plug welded to a cylindrical steel tube. Welded to this tube are six fins shaped to receive the six silk bags containing the propellant increments. Between each set of fins are three gas escape ports for the propellant gases from the cartridge which fits inside the tube. The cartridge is held in place by a countersunk ring screwed into the end of the tube. The cartridge resembles a shotgun shell.

Type 100 81-mm High-Explosive Mortar

Weight complete round: 7.52 pounds.
Weight main charge: 1.18 pounds.

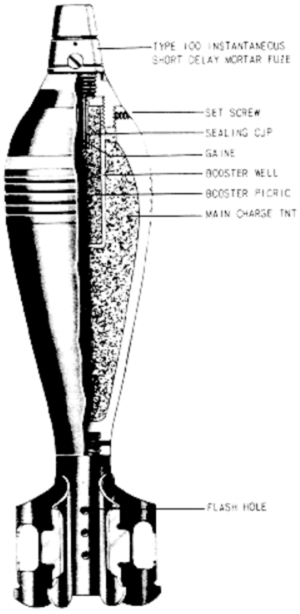


Figure 304—Type 100 81-mm High-Explosive Mortar.

Explosive components:
  Main charge: TNT.
  Booster: Picric.
  Propellant:
    Nitrocellulose and graphite: 58.0 percent.
    Nitroglycerine: 7.1 percent.
    Dinitrotoluene: 25.7 percent.
    Diphenylamine: 0.5 percent.
    Potassium Nitrate: 8.7 percent.
Over-all length (without fuze): 11.78 inches.
Length fin assembly: 3.31 inches.
Maximum diameter at bourrelet: 3.19 inches (81 mm).
Maximum diameter tail fins: 3.19 inches.
Color: Black over all with a red tip. A yellow band is painted before the bourrelet.
Fuzing: Type 100 instantaneous short-delay mortar fuze.
Weapons in which used:
  Type 97: 81-mm mortar.
  Type 99: 81-mm mortar.

Description: Except for minor details, this shell is similar to the Type 97 81-mm H. E. The cup to receive the fuze gaine is held in place in the booster cup by being fitted into a brass ring which screws into the fuze adapter ring above the booster cup. There is no retaining ring to hold the cartridge in the tail fin section. Instead, the cartridge is held by a friction fit.

81-mm Parachute H. E. Mortar

Weight complete round: 3.87 pounds.
Weight main charge: 4 ounces.
Explosive components:
  Main charge:
    RDX (1 block).
    TNT (2 blocks).
Over-all length: 21.25 inches.
Length of shell (less propellant container and nose plug): 18.5 inches.
Diameter of shell body: 1.5 inches.
Diameter of fins: 3.19 inches (81 mm).
Diameter of H. E. cylinder: 1.37 inches.
Length of H. E. cylinder : 7.0 inches.
Color: Black over all with an unpainted wooden plug in the nose.
Weapon in which used: Standard 81-mm smoothbore mortars.

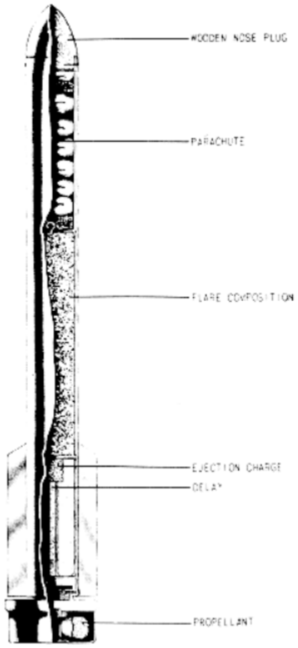


Figure 305—81-mm Parachute High-Explosive Mortar.

Description: This mortar shell is a black steel tube with an ogival wooden block sealing the forward end. Six fins which give the shell an 81 mm diameter are spot welded along the after part of the tube. A steel disc drilled through the center for the delay lead-in is welded to the tube ½ inch from the base. Forward of the disk is a 5-inch wooden block through the center of which runs the 12-second black powder delay element. The forward end of the wooden block contains the ejection charge. The H. E. cylinder and parachutes are located forward of the ejection charge. The cylinder consists of a steel case, a central tube containing the 45-second self-destruction delay train, a friction igniter, and three cylindrical explosive blocks fitted around the central tube. The booster fits in the forward block. The parachute which supports the cylinder is secured to a small fixed U-bolt on the cylinder by nine short (13-inch) shrouds. A second parachute above the first is secured to the friction igniter by a line 32 feet 4 inches long. This line leads through a central hole in the lower parachute.

The tinned steel propellant container is 81 mm in diameter and 1 inch deep. A neck on the container cover fits into the base of the mortar shell and is secured by three small screws passing through the sides of the shell and the neck of the cover.

Operation: When the shell is fired, the flash from the black powder primer ignites the propellant and the 12-second delay train. Setback shears the small screws securing the propellant container

to the shell, and when the force of the propellant is expended the container falls free. Twelve seconds after firing, the delay train ignites the ejection charge forcing the H. E. cylinder and parachutes out the forward end of the shell. The 45-second self-destroying delay train is also ignited by the ejection charge. Planes striking the 32 foot parachute cord which is attached to the igniter will cause it to explode the H. E. cylinder. After 45 seconds, the self-destroying element detonates the cylinder.

81-mm Parachute H. E. Smoke Mortar

Weight complete round: No data.
Weight main charge: No data.
Explosive components: Main charge: Tetryl.
Over-all length: 21.87 inches.
Length of shell (less propellant container and nose plug): 19.1 inches.

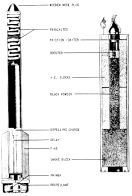


Figure 306—81-mm Parachute High-Explosive Smoke Mortar.

Diameter of shell body: 1.5 inches.
Diameter of fins: 3.19 inches (8.1 mm).
Color: Unpainted galvanized iron with a yellow wooden nose and a green band around the body.

Description: This shell is similar to the H. E. round except that there is a smoke pellet in the bottom of the suspended cylinder. Above the smoke pellet are two pellets of tetryl with a black powder delay train running through the middle. As with the H. E. round, the line to the upper parachute is attached to a pull igniter and, if pulled before the self-destroying feature operates, will detonate the charge.

Operation: The operation is similar to the H. E. round except that the expelling charge ignites the smoke-flare pellet, which burns about 53 seconds and which then ignites the short delay train which burns seven seconds before the self-destroying element functions.

81-mm Parachute-Flare Mortar

Weight complete round: 4.87 pounds.
Weight flare composition: 409 grams.

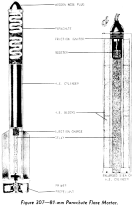


Figure 307—81-mm Parachute Flare Mortar.

Explosive components:
  Flare composition: No data.
Over-all length: 22.25 inches.
Length of shell (less propellant container and nose plug): 18.75 inches.
Diameter of shell body: 1.75 inches.
Diameter of fins: 3.19 inches (81 mm).
Diameter of flare cylinder: 1.37 inches.
Length of flare cylinder: 7.75 inches.
Color: Unpainted galvanized steel body with a red wooden plug in the nose.
Weapon in which used: Standard 81-mm smoothbore mortars.

Description: This mortar shell resembles in construction the 81-mm H. E. parachute mortar shell; the only differences being in dimensions. A thin sheet-metal tube containing the flare composition is located before the ejection charge. Two parachutes are packed in an inner sleeve 5.5 inches long made in two longitudinal half sections and are attached by means of 14-inch and 15-foot 3-inch cords, respectively, to an eyebolt threaded into the forward end of the metallic flare composition. The wooden nose plug is secured to the outer shell by two small nails.

Operation: The operation of this shell is the same as the 81-mm H. E. parachute mortar shell. The ejection charge ignites the flare composition as it ejects the flare cylinder from the shell.

Type 94 90-mm High-Explosive Mortar.

Weight complete round: 11.8 pounds.
Weight main charge: 2.35 pounds.
Explosive components:
  Main charge: TNT.
  Booster: Picric (presumed).
Over-all length (without fuze): 15.83 inches.
Length fin assembly: 4.02 inches.
Maximum diameter at bourrelet: 3.54 inches (90 mm).
Maximum diameter tail fins: 3.54 inches.
Color: Black over all with a red tip and a yellow band before the bourrelet.

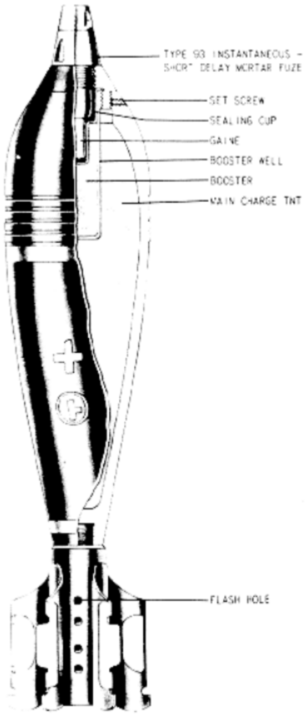


Figure 308—Type 94 90-mm High-Explosive Mortar.

Fuzing: Type 93 instantaneous short-delay mortar fuze.
Weapons in which used:
  Type 94: 90-mm motar.
  Type 97: 90-mm mortar.

Description: This shell is similar in construction to the type 97 81-mm mortar shell.

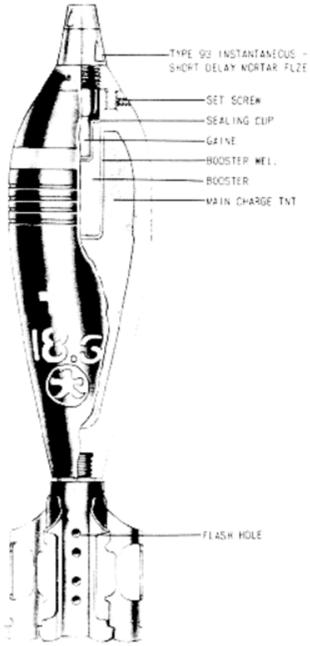


Figure 309—Type 94 90-mm Semi-Steel High-Explosive Mortar.

Type 94 90-mm Semisteel H. E. Mortar

Weight complete round: 11.5 pounds.
Weight main charge: No data.
Explosive components:
  Main Charge: TNT.
  Booster: No data.
  Propellant: No data.
Over-all length (without fuze): 14.25 inches.
Length fin assembly: 4.0 inches.
Maximum diameter at bourrelet: 3.54 inches (90-mm).
Maximum diameter of fins: 3.54 inches.
Color: Black over all with a red tip and a green band before the bourrelet.
Fuzing: Type 93 instantaneous short-delay mortar fuze.

Weapons in which used:
  Type 94: 90-mm mortar.
  Type 97: 90-mm mortar.

Description: This shell is similar in design to the type 94 90-mm H. E. shell, except that it is made of low-grade or semisteel instead of high-grade steel.

Type 94 90-mm Incendiary Mortar

Weight complete round: 11.6 pounds.
Weight incendiary mixture: 2.2 pounds.
Weight burster charge: 2.75 ounces.

Explosive components:
  Burster Charge: No data.
  Propellant: No data.

Incendiary filling: Phosphorus, carbon disulphide, and 40 cylindrical rubber pellets
Over-all length (without fuze): 15.9 inches.
Length fin assembly: 4.0 inches.
Maximum diameter at bourrelet: 3.54 inches (90-mm).
Maximum diameter of tail fins: 3.54 inches.
Color: Black body with blue bands around the nose, a yellow band half way between the bourrelet and tail and white band at junction of body and tail
Fuzing: Type 93 instantaneous short-delay mortar fuze (presumed).
Weapons in which used:
  Type 94: 90 mm mortar.
  Type 97: 90 mm mortar.

Description: This shell is similar in design to the type 94 90-mm H. E. mortar shell, with the following exceptions:

1. An enlarged booster cup threads into the nose of the projectile. It contains a well for the lower fuze body and detonator, a burster charge, and a wooden block.

2. A fuze adapter threads into the forward end of the booster cup.

Remarks: A shell of similar construction, weight, and measurements contains a filling of diphenylcyanarsine (DC). The shell is painted black over-all and has a red band around the nose with a blue band adjacent to it. There is a yellow

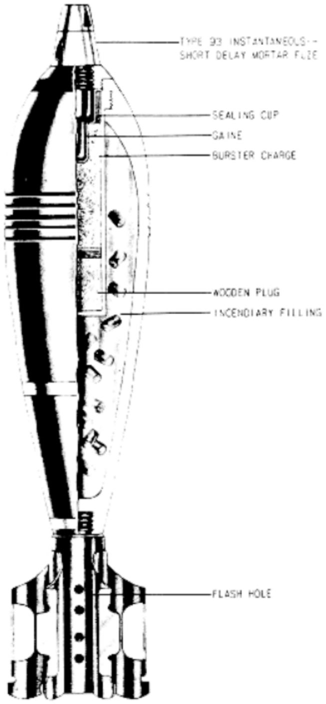


Figure 310—Type 94 90-mm Incendiary Mortar.

band aft of the bourrelet and a red band half way between the bourrelet and the tail. There is a white band at the junction of the shell body and tail.

Type 2 120-mm High-Explosive Mortar

Weight complete round: 26.5 pounds.
Weight main charge: 6.0 pounds.
Explosive components:
  Main charge: TNT.
  Booster: RDX and wax.
Over-all length (without fuze): 22.5 inches.
Length fin assembly: 6.2 inches.
Maximum diameter at bourrelet: 4.7 inches (120 mm).
Maximum diameter of tail fins: 4.7 inches.
Color: Black over all with a red tip and a yellow band forward of the bourrelet.
Fuzing: Type 100 instantaneous short delay mortar fuze.
Weapons in which used: Type 2, 120-mm mortar.

Description: The body section of this shell is similar to that of the standard Army finned mortar types but the tail fin section resembles that of the Navy 81-mm H. E. The 12 fins are welded to the

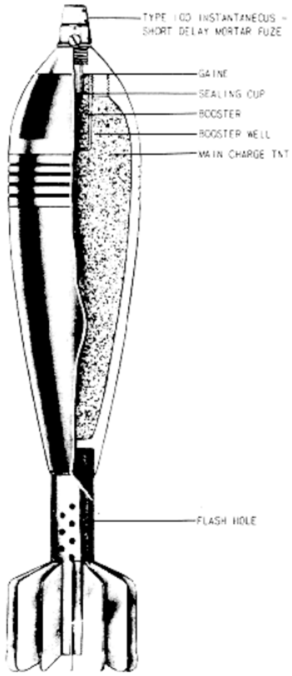


Figure 311—Type 2 120-mm High-Explosive Mortar.

propellant tube which is welded to the base of the body. The forward end of the tube has 42 escape ports arranged in 6 rows to allow the flash to pass from the primary cartridge to the propellant increments. The initial charge is contained in a cardboard case which fits inside the propellant tube and is held in place by a steel plug fitted with the primer cap. The main propelling charge is contained in 6 doughnut shaped silk bags which are split so that they can be slipped around the propellant tube above the tail fins and over the flash ports.

Remarks: A variation of this shell has been found with the tail section threaded into the body and secured by a pin instead of being welded to the body.

Type 96 150-mm High-Explosive Mortar

Weight complete round: 58.06 pounds.
Weight main charge: 12.9 pounds.

Explosive components:
- Main charge: TNT.
- Booster: Picric.
- Propellant:
  - Nitrocellulose and graphite: 58.0 percent.
  - Nitroglycerine: 7.1 percent.
  - Dinitrotoluene: 25.7 percent.
  - Diphenylamine: 0.5 percent.
  - Potassium nitrate: 8.7 percent.

Over-all length (without fuze): 28.75 inches.
Length fin assembly: 7.81 inches.
Maximum diameter at bourrelet: 5.9 inches (150 mm).
Maximum diameter of tail fins: 5.87 inches.
Color: Black over all with a red tip, a yellow band below the bourrelet, and a white band before the tail-fin assembly.
Fuzing: Type 93 instantaneous short-delay mortar fuze.
Weapon in which used: Type 96 150-mm smoothbore mortar.

Description: The construction of this shell is similar to that of the type 97 81-mm H. E. mortar shell.

Figure 312—Type 96 150-mm High-Explosive Mortar.

Type 97 150-mm High-Explosive Mortar

Weight complete round: 43.5 pounds.
Weight main charge: 8.98 pounds.
Explosive components:
- Main charge: TNT.
- Booster: RDX and wax.

Figure 313—Type 97 150-mm High-Explosive Mortar.

Propellant:
    Nitrocellulose and graphite: 58.0 percent.
    Nitroglycerine: 7.1 percent.
    Dinitrotoluene: 25.7 percent.
    Diphenylamine: 0.5 percent.
    Potassium nitrate: 8.7 percent.
Over-all length (without fuze): 23.7 inches.
Length fin assembly: 6.7 inches.
Maximum diameter at bourrelet: 5.9 inches (150 mm).
Maximum diameter tail fins: 5.87 inches.
Color: Black over all with a red nose tip and a yellow band before the bourrelet.
Fuzing: Type 100 instantaneous short-delay mortar fuze.
Weapon in which used: Type 97 150-mm smoothbore mortar.

Description: Except for its shorter size, this projectile is similar in construction to the type 96 H. E. long round.

32-cm Spigot-Type Mortar

Weight complete round: 737 pounds.
Weight nose section loaded: 172 pounds.
Weight center section loaded: 215 pounds.
Weight tail section loaded: 350 pounds.
Weight main charge: 103 pounds.
Explosive components:
    Main charge: Picric.
    Booster: P. E. T. N.
    Propellant: Black powder and nitrocellulose.
Over-all length (without fuze): 61 inches.
Length nose section (less threaded portion): 13.75 inches.
Length center section (less threaded portion): 10.92 inches.
Length tail section: 36.31 inches.
Body diameter: 12.62 inches (320 mm).
Inside diameter of tail section: 10.12 inches.
Maximum diameter of tail fins: 25.25 inches.
Length tail fins: 21.4 inches.
Color: The projectile is painted black over-all with a red nose tip and a yellow band around the rear of the nose section.
Fuzing: Type 98 Interior Fuze.
Weapons in which used: Special spigot-type projector.

Description: The projectile, which resembles a bomb, is made in three parts. The nose section, ogival in shape, is externally threaded at its base to screw into the center section and is internally threaded to receive a steel base plate. It has a booster cup fitted with a fuze adapter screwed into the nose.

The center section is a short cylinder, solid on the base and threaded externally to screw into the tail section. It is closed at the forward end, with a steel plate having a fuze-adapter ring, fitted with a booster cup, welded in its center.

The tail section screws onto the center section and has a gradual taper toward the rear from a

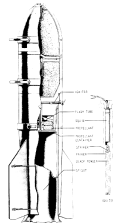


Figure 314—32-cm Spigot-Type Mortar.

point 14.5 inches below the forward end. It is hollowed out to fit over the projector tube. Four sheet-steel tail fins, each braced by two stabilizing wires, are welded to the tail section.

For convenience in handling and assembling, steel bands, each fitted with two double handles, are provided. Before the firing of the projectile, the carrying bands are removed.

The propellant charge is placed in a brass pot which fits into the recessed portion of the projector tube. The charge is contained in a cardboard container having a brass flash tube passing through its vertical axis, through the brass pot, and being screwed into the spigot. There is a drilled and tapped hole near the forward end of the tail section of the projectile into which the igniter tube screws. When in position, the end of the igniter tube is in close proximity to the end of the brass flash tube which leads into the propellant charge.

Chapter 4—Section 4

ARMY PROJECTILE FUZES

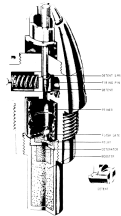


Figure 315—Type 93 Small Instantaneous Fuze.

Type 93 Small Instantaneous Fuze

Use: Ammunition for 20-mm aircraft, antitank, and antiaircraft guns; 37-mm tank and antitank guns.

Over-all length (with gaine): $1\frac{15}{16}$ inches.

Over-all length (without gaine): $1\frac{1}{16}$ inches.

Maximum diameter: $\frac{3}{4}$ inch.

Threaded length: $\frac{1}{4}$ inch.

Number of threads: 5, right-hand.

Construction: The fuze is of two-piece brass construction with an aluminum striker head. The

lower piece houses a centrifugal detent, a primer, and a flash-hole shutter. The gaine threads into the lower piece.

Operation: The centrifugal detent, which supports the striker, is held in place by the striker and detent spring until the projectile decelerates. Then the striker creeps forward and centrifugal force causes the detent to move out. The flash shutter is also moved out by centrifugal force and the fuze is armed. On impact the striker is driven into the primer.

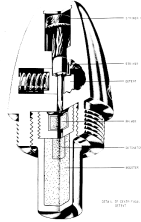


Figure 316—Type 100 Small Instantaneous Fuze.

Type 100 Small Instantaneous Fuze

Use: Ammunition for 20-mm aircraft, antiaircraft, and antitank cannon, and 37-mm tank, antitank, and aircraft guns.

Over-all length (with gaine): 1⅝ inches.
Over-all length (without gaine): 1 inch.
Maximum diameter: ¾ inch.
Threaded length: ¼ inch.
Number of threads: 5, right-hand.

Construction: The fuze is made of brass in one piece. A centrifugal detent supports the striker. Above the striker there is a wooden striker head. The fuze is threaded internally (L. H.) to take the gaine.

Operation: The centrifugal detent, supporting the striker, is held in place by the striker and detent spring until the projectile decelerates. Then the striker creeps forward and centrifugal force causes the detent to move out, arming the fuze. On impact the striker is driven into the primer.

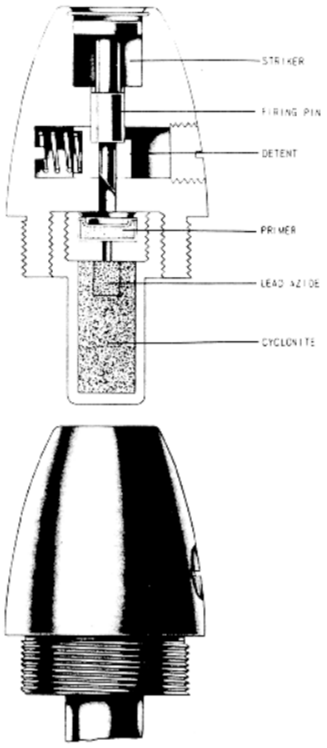


Figure 317—Type 2 Small Instantaneous Fuze.

Type 2 Small Instantaneous Fuze

Use: Ho-5 20-mm H. E. I. projectiles.

Over-all length with gaine	59/64 inch
Threaded length	1/4 inch
Number of threads	6

Construction: This fuze is identical to the type 100 small instantaneous fuze except that the body of the type 100 is brass and the body of this fuze is of light metal alloy. A modification of this fuze has the detent hole secured with a staked plug rather than a screw.

Operation: The operation is the same as the type 100 small instantaneous fuze.

Type 2 Modified Small Instantaneous Fuze

Use: 20-mm H. E. I. projectile.

Description:

Over-all length with gaine: 59/64 inch.

Threaded length: 1/4 inch.

Number of threads: 6.

Construction: This is an air-column fuze with a one-piece metal alloy body. Threaded into the base of the fuze is a gaine above which is an air column sealed at the top by a closing disk.

Operation: There are no arming features in this fuze. On impact, the closing disk is crushed inward, compressing the air in the column and firing the gaine.

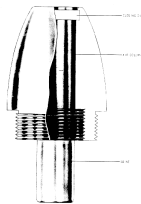


Figure 318—Type 2 Modified Small Instantaneous Fuze.

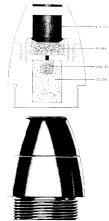


Figure 319—Type 4 Super Detonating Fuze.

Type 4 Super Detonating Fuze

Use: Ho–5 20-mm H. E. I. projectiles.

Description:

- Over-all length with gaine: $\frac{59}{64}$ inch.
- Threaded length: ¼ inch.
- Number of threads: 6.

Construction: This is an air-column fuze with the gaine enclosed in the fuze body. The fuze is of two-piece construction, with the upper part containing the air column and primer and the lower part containing the gaine. The inclusion of the gaine in the fuze body leaves space for more explosive in the projectile.

Operation: There are no arming features in this fuze. On impact, the closing disk is crushed inward, compressing the air in the column and firing the gaine.

Ho 301 Impact Fuze

Use: 40-mm projectiles for the Ho 301 aircraft cannon.

Description:
- Over-all length (with gaine): 1⅝ inches.
- Over-all length (without gaine): 1⅛ inches.
- Maximum diameter: 1½ inches.
- Threaded length: ¼ inch.
- Number of threads: 6.

Construction: The fuze body is made of one piece. The striker is supported by a centrifugal detent which is held under a shoulder of the striker by two locking centrifugal detents. The gaine threads into the bottom of the fuze.

Operation: Centrifugal force causes the locking detents to move out, thus freeing the striker detent which moves out arming the fuze. On impact the striker is driven into the primer.

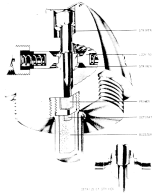


Figure 320—HO 301 Impact Fuze.

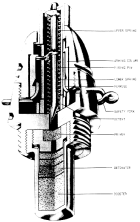


Figure 321—Type 88 Small Instantaneous Fuze.

Type 88 Small Instantaneous Fuze

Use: H. E. projectiles for the 50-mm grenade discharger.

Description:

Over-all length (with gaine): 2⅜ inches.
Over-all length (without gaine): 1⅝ inches.
Maximum diameter: 1 inch.
Threaded length: 5/16 inch.
Number of threads: 5, right-hand.

Construction: The fuze body is of two-piece brass construction. The upper part is threaded (R. H.) into the lower part, with the striker head protruding from the upper fuze body. The striker assembly is supported by steel wedges which rest beneath the striker sleeve and two coiled springs. The steel wedges are held in position by the lower portion of a circumferential latch spring which is fitted around the striker sleeve. An arming collar surrounds a portion of the striker assembly and the upper portion of the latch spring. This collar is supported by the lower of two striker supporting coiled springs and the latch spring.

Operation: When the projectile is fired, setback forces the arming collar down until the notch on the inner side of the collar engages the latch springs. As the projectile decelerates, the lower spring forces the arming collar up, thus pulling the latch spring collar free of the wedges. Centrifugal force moves the wedges out, leaving the striker supported only by the coiled springs. On impact, the striker is driven down into the primer.

Remarks: Both brass and steel bodies have been recovered.

Type 88 Short-Delay (Gun and Howitzer Mortar) Fuze

Use:

Gun type: H. E. projectiles for 57-mm tank

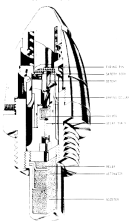


Figure 322—Type 88 Short-Delay (Gun and Howitzer-Mortar) Fuze.

guns, 70-mm tank guns, 75-mm guns, and 105-mm guns.

Howitzer-mortar type: H. E. projectiles for 70-mm, 120-mm, and 150-mm howitzers.

Description:

Over-all length (with gaine): $3\frac{1}{16}$ inches.
Over-all length (without gaine): $2\frac{3}{8}$ inches.
Maximum diameter: $1\frac{1}{4}$ inches.
Threaded length: $\frac{1}{2}$ inch.
Number of threads: 6, right-hand.

Construction: The brass fuze body is made of two major parts, threaded (L. H.) together, with an aluminum striker head. The external striker is supported by a spring and four steel wedges. A setback collar which surrounds the wedges is held in position by the latch springs. The latch springs are fastened around the circumference of a movable primer-delay carrier.

The howitzer-mortar type fuze differs from the gun type fuze in that only the striker can move, the primer carrier being threaded to the body. The howitzer-mortar fuze also has weaker latch springs, allowing the fuze to function on a smaller amount of set-back.

Operation: Set-back causes the set-back collar to move down until it is engaged by the latch springs. The wedges are held in place by the striker until deceleration sets in. At this point they move out, impelled by centrifugal force, arming the fuze. On impact (in the gun fuze only) both the striker and the primer-delay carrier are free to move. This is to minimize the possibility of an unexploded projectile due to a very low angle of impact.

Type 88 Instantaneous (Gun and Howitzer Mortar) Fuze

Use:

Gun type fuze: H. E. projectiles for the 47-mm antitank gun, 57-mm tank gun, 75-mm guns, and 105-mm guns. This fuze is also used in incendiary and smoke projectiles for 75-mm guns.

Howitzer-mortar type fuze: Used in H. E. projectiles for 70-mm howitzer, 105-mm guns and howitzers, 120-mm howitzer, and 150-mm howitzers. It is also used in a smoke projectile for the 150-mm howitzer.

Description:

Over-all length (with gaine): $3\frac{5}{16}$ inches.
Over-all length (without gaine): $2\frac{7}{8}$ inches.
Maximum diameter: 1 inch.
Threaded length: 0.5 inch.
Number of threads: 5, right-hand.

Construction: The fuze body, of either black steel or brass, is made into two parts fitted together with threads (L. H.). The head of the aluminum striker protrudes from the fuze and is held in the unarmed position by four wedges which rest on a raised collar of the lower fuze body and are held in place by an arming collar. The arming collar is supported by latch springs. The striker in the armed position is held from the primer by a coiled spring.

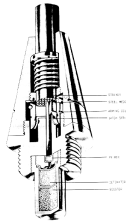


Figure 323—Type 88 Instantaneous (Gun and Howitzer-Mortar) Fuze.

Operation: Set-back causes the set-back or arming collar to move down until the notch on the inner side of the collar is engaged and held down by the latch springs. Centrifugal force moves the wedges out, arming the fuze. On impact the striker is forced down, overcoming the spring tension, to strike the primer.

Remarks: The howitzer-mortar and the gun type fuze are identical in construction except that the howitzer-mortar fuze has a weaker latch spring, which allows for arming with a smaller amount of set-back force.

Type 90 Instantaneous—Short-Delay Fuze

Use: Long pointed 15-cm projectile.
Description:
  Over-all length (with gaine): 4⅜ inches.
  Over-all length (without gaine): 3¾ inches.
  Maximum diameter: 1⅝ inches.
  Threaded length: 5/16 inch.
  Number of threads: 4, right-hand.

Construction: The fuze resembles in appearance a large-sized type 88 short-delay fuze. It has an aluminum striker head, a brass three-piece body, and a brass gaine. It has the following safety features: a heavy creep spring, hourglass shaped centrifugal detents under the striker, a centrifugal shutter, which is held in place until after set-back by an arming collar-latch spring arrangement, and a safety fork, which also prevents the arming collar from moving down until the fork has been removed.

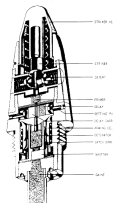


Figure 324—Type 90 Instantaneous-Short-Delay Fuze.

Settings of instantaneous or short delay are accomplished by means of a sliding delay carrier, which has both an open channel and a powder delay channel. This delay carrier can be moved horizontally in its housing, so that either the instantaneous or short-delay channel is aligned with the firing train, by pushing on the proper setting pin with any sharp instrument. The delay carrier is held in place by friction and by centrifugal force after the projectile has been fired.

Operation: Set-back forces the striker down on the hourglass detents, holding them in place, and also forces the arming collar down, compressing its spring, so that the latch springs are engaged. As set-back decreases, the striker is forced up by its spring, releasing the detents, which move out against their springs because of centrifugal force. The arming collar spring also forces the arming collar up, carrying the latch springs with it. This allows centrifugal force to move the shutter out, thus clearing the flash channel. On impact, the striker is driven into the primer, which flashes either into the delay element or into the instantaneous channel, depending on the setting, and from there to the detonator. The detonator initiates the gaine.

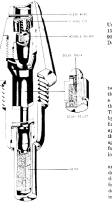


Figure 325—Type 93 Instantaneous-Short-Delay Fuze.

Type 93 Instantaneous—Short-Delay Fuze

Use: H. E. projectiles for the 81-mm, 90-mm, and 150-mm mortars and incendiary projectiles for the 90-mm mortar.

Description:

Over-all length (with gaine): $3\frac{13}{16}$ inches.
Over-all length (without gaine): $2\frac{13}{16}$ inches.
Maximum diameter: $1\frac{1}{4}$ inches.
Threaded length: $\frac{1}{2}$ inch.
Number of threads: 5, left-hand.

Construction: The brass fuze body is made in two major parts joined together by (right-hand) threads. A housing, containing the firing pin and a movable primer, is press-fitted into a recess in the upper fuze body and supported by a shear pin. The firing pin and movable primer are separated by a coiled spring. The primer is held from the firing pin by a metal washer with two ears 180° apart. These ears fit into longitudinal slots in the lower part of the firing pin housing and rest against the under side of a shoulder in the upper fuze body. The gaine threads (left-hand) into the lower fuze body.

Operation: On impact the shear wire is broken and the lower part of the firing pin housing is driven down into a recess in the upper fuze body, thus freeing the primer to move forward onto the firing pin. The choice of instantaneous or short delay is made by unscrewing the upper body and inserting or removing a delay pellet.

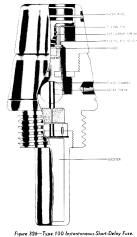


Figure 326—Type 100 Instantaneous-Short-Delay Fuze.

Type 100 Instantaneous—Short-Delay Fuzes

Use: H. E. projectiles for 81-mm, 90-mm, and 150-mm mortars.

Description:

Over-all length (with gaine): $3\frac{5}{16}$ inches.
Over-all length (without gaine): $2\frac{3}{32}$ inches.
Maximum diameter: $1\frac{1}{4}$ inches.
Threaded length: $\frac{5}{16}$ inch.
Number of threads: 6, left-hand.

Construction: The fuze body is of two-piece brass construction, with the upper part threading (right-hand) into the lower. A housing, containing the firing pin and a movable primer, is press-fitted into a recess in the upper fuze body and supported by a shear pin. The firing pin and movable primer are separated by a coiled spring. The primer is held from the firing pin by a metal washer containing two ears 180° removed. These ears fit into longitudinal slots in the lower part of

the firing pin housing and rest against the underside of a shoulder in the upper fuze body. A selector for short delay or instantaneous action is located and extends across the lower fuze body. This selector consists of a solid brass cylinder, one end of which is slotted for external control. Passing through the cylinder is a hollow flash channel for instantaneous action. Ninety degrees removed and in the same vertical plane is a delay channel which intercepts the instantaneous channel. The gaine threads (left-hand) into the lower fuze body.

Operation: On impact the shear wire is broken and the lower part of the firing-pin housing is driven down into a recess in the upper fuze body, thus freeing the primer to move forward onto the firing pin. The primer flashes through the selector switch to the explosive train.

Finned Bangalore Torpedo Fuze

Use: 50-mm finned bangalore torpedo.
Description:
  Over-all length (with gaine): 3 15/16 inches.
  Maximum diameter: 1⅝ inches.
  Threaded length: ¼ inch.
  Number of threads: 6.

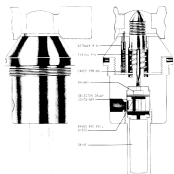


Figure 327—Finned Bangalore Torpedo Fuze.

Construction: The fuze consists of a brass vane cap and vanes, black steel two-piece body, brass keyed striker, steel creep spring, brass selector delay, container, and a brass gaine. Either an instantaneous or a short delay setting may be made by inserting a screw driver into the slotted end of the cylinder and rotating the cylinder in the selector delay container so the instantaneous flash channel is either open for instantaneous burst, or closed for a short delay burst. The delay powder train is ignited in either case. A set-back pin prevents the vanes from rotating until the projectile is fired.

Operation: The arming fork is removed when the finned bangalore is ready to be fired. When it is fired, the set-back forces the set-back pin down, allowing the vanes to rotate up and off, leaving the striker exposed and supported only by its creep spring. On impact, the striker compresses the creep spring and is driven into the primer. The flash from the primer ignites the delay train and, if the instantaneous channel is open, also flashes directly into the gaine.

Type 98 Interior Fuze

Use: 32-cm spigot mortar.
Description:
Over-all length (with gaine): $3\frac{15}{16}$ inches.
Maximum diameter: $1\frac{15}{64}$ inches.
Threaded length: $\frac{3}{4}$ inch.
Number of threads: 8.

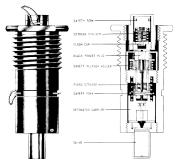


Figure 328—Type 98 Interior Fuze.

Construction: The fuze consists of two sections housed in a one-piece body. The two sections are separated by a fuzed striker housing. The upper section consists of a flash cap and a set-back striker and striker block separated by a safety spring and upper safety fork. Below the flash cap is a hard block of black powder. The safety plunger is spring-loaded upward against the block by the safety plunger spring, which also bears against the fixed striker housing. Two safety plungers which are fixed to the safety plunger holder protrude through holes in the fixed firing pin. The fixed firing pin and inertia primer housing are separated by an anti-creep spring and lower safety fork.

Operation: The upper safety fork is removed from the fuze in the nose section, the other forks having been removed during assembly of the round. Upon setback the setback striker hits the flash cap. The flash from the cap burns the black-powder plug and allows the safety plunger holder to move forward. This raises the two safety plungers, exposing the fixed striker to the detonator carrier. On impact the detonator carrier moves forward against the anticreep spring and hits the fixed firing pin.

Type 89 Small Time Fuze

Use: Smoke projectiles for the 50 mm grenade discharger and illuminating projectiles for the 70-mm Mortar and the 70-mm howitzer.

Description:

Over-all length: 1¾ inches.

Maximum Diameter: $1\frac{7}{16}$ inches.

Threaded Length: ¼ inch.

Number of Threads: 4, left-hand.

Construction: The fuze is made of brass, consisting of the main body and a nose cap fitted together by L. H. threads. There are two brass time rings, one being fixed and the other movable. The primer is located in the lower part of the fuze and is separated from the striker by a spring. The striker is also supported by a safety wire which passes through the nose of the fuze.

Operation: The safety wire holding the striker is removed before the projectile is fired. On setback the striker moves down against the spring to hit the primer. The flash from this ignites the powder train, which burns through the two time rings into the magazine at the base of the fuze.

Remarks: This fuze has a time setting of 0 to 20 seconds in increments of ½ second.

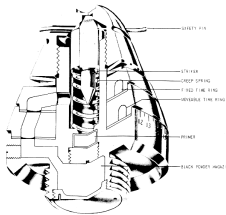


Figure 329—Type 89 Small Time Fuze.

Type 89 Powder Time Fuze

Use: H. E. projectiles for the 75-mm and 105-mm antiaircraft guns.

Description:
- Over-all length: 3⅞ inches.
- Maximum diameter: 2⅜ inches.
- Threaded length: ⅜ inch.
- Number of threads: 4, right-hand.

Construction: This fuze is made of brass and consists of a nose cap, a central spindle, and four powder time rings. Of the four powder rings surrounding the spindle, the first and third are fixed. The second and fourth rings are movable and keyed so that they move as one unit. Housed

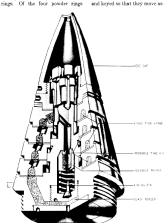


Figure 330—Type 89 Powder Time Fuze.

in the base of the central spindle is a firing pin which is separated from the movable primer by a small coiled spring. The base plate contains a flash charge of black powder.

Operation: This fuze may be set for any time between 0 and 30 seconds in increments of $\frac{1}{5}$ second. On set-back the primer moves down onto the fixed firing pin, sending a flash up through the central spindle to the upper time ring. As the last powder time ring burns, the flash is transmitted to a black-powder magazine and thence to an auxiliary detonating fuze which is used in conjunction with this fuze and is threaded into the fuze pocket separately.

Remarks: This fuze is also used in Navy 8-cm antiaircraft projectiles.

Auxiliary Detonating Fuze

Use: In conjunction with the type 89 (powder time), type 2 powder time and impact fuze and type 100 mechanical time and impact fuze.

Description:
Over-all length: $1\frac{15}{16}$ inches.
Length (without gaine): $1\frac{1}{4}$ inches.
Maximum diameter: $1\frac{1}{2}$ inches.
Threaded length: $\frac{5}{16}$ inch.
Number of threads: 7, right-hand.

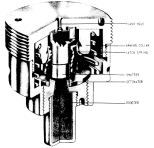


Figure 331—Auxiliary Detonating Fuze.

Construction: This fuze is made of two brass sections. The top portion is threaded (R. H.) externally to fit into the fuze pocket and internally to receive the base portion. Centrally located in the top plate is a flash hole leading to a relay charge and the gaine. The mechanism housed within the fuze consists of an arming collar supported by a coiled spring and the ears of a circumferential latch spring. In the unarmed position, a metal shutter, held in place by the lower portion of the latch spring, closes a flash channel from the relay charge to the gaine. The gaine threads into the lower portion.

Operation: On set-back the arming collar moves down, engaging the ears of the latch spring. During deceleration, the coiled spring raises the arming collar and latch spring, freeing the shutter, which moves out with centrifugal force and leaves the flash channel open.

Type 3rd-Yr. Combination Powder Time and Impact Fuze

Use: 75-mm shrapnel and old H. E. projectiles.

Description:
Over-all length: $2\frac{7}{16}$ inches.
Maximum diameter: 2⅝ inches.
Threaded length: ½ inch.
Number of threads: 4, right-hand.

Construction: This fuze is made of brass. A central spindle and base section are made in one piece. Two powder time rings (the upper fixed, the lower movable) are fitted around the spindle and held in place by a nose cap, which threads onto the top of the spindle. The time-ring primer is housed in the nose cap and before firing is supported by a safety pin which passes through

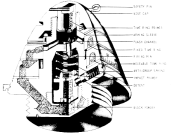


Figure 332—Type 3d-year Combination Powder Time and Impact Fuze.

it and the nose cap. The primer is also supported by an arming sleeve. A partition in the hollow spindle has a firing pin on both sides. A second movable primer (impact primer) is housed in the base of the spindle. It is held in place by two centrifugal detents and separated from the firing pin by a coiled spring. A base plate threads into the base section and contains a black-powder magazine. The movable time ring graduated from 0 to 22 seconds in increments of ⅕ second.

Operation: Before firing, the safety pin is removed and the time ring set. On setback the time ring primer moves down onto the firing pin. The flash from the primer passes through a flash channel to the upper time ring. The powder train leads through the time rings down to the black powder magazine.

Centrifugal force causes the detents to move out, freeing the impact primer, and, if the projectile hits before the time setting has elapsed, the primer carrier moves against the spring onto the firing pin. The flash from the primer sets off the black-powder magazine.

Type 5th-Year Combination Powder Time and Impact Fuze

Use: 75-mm shrapnel, incendiary, and illuminating projectiles, 105-mm shrapnel and incendiary projectiles, and 150-mm shrapnel and illuminating projectiles.

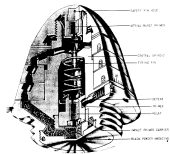


Figure 333—Type 5th-year Combination Powder Time and Impact Fuze.

Description:
Over-all length: 2 13/16 inches.
Maximum diameter: 2⅜ inches.
Thread length: ½ inch.
Number of threads: 3, right-hand.

Construction: This fuze is made of brass. A central spindle and base section are of one piece. Three powder time rings are fitted over the spindle and held in place by a nose cap which threads onto the top of the spindle. Housed in the nose cap is an aerial-burst primer carrier seated in a metal cup. The base of this cup has one centrally located hole. The top of the sides are flanged and rest on a shoulder of the central spindle. A safety pin is fitted through the nose cap and the primer carrier. A partition in the hollow spindle contains a firing pin pointed on either end. Housed in the base of the spindle is a detent-held, movable impact primer carrier which is separated from the firing pin by a coiled spring. A base plate threads into the base section and contains a black-powder magazine. The top and lower powder time rings are keyed together and movable; the center ring is stationary. The rings are graduated from 0 to 36.6 seconds in increments of ⅕ second.

Operation: Before firing, the safety pin is removed and the time rings set. On setback, the aerial burst primer moves down onto the stationary firing pin, and the resulting flash ignites, through a flash channel, the upper time ring. The powder train leads through the time rings down to the black-powder magazine in the base of the fuse.

Centrifugal force causes the detents to move out, freeing the impact primer, and, if the projectile hits before the time setting has elapsed, the primer carrier moves against the spring onto the firing pin. The flash from the primer sets off the black-powder magazine.

Type 100 Mechanical Time and Impact Fuze

Use: Antiaircraft ammunition for type 14-year 105-mm A. A. gun and type 99 88-mm A. A. gun.

Description:
Over-all length: 4⅜ inches.
Maximum diameter: 2⅜ inches.
Threaded length: 5/16 inch.
Number of threads: No data.

Construction: This is a 50-second combination mechanical time and impact projectile fuze. The clockwork mechanism is essentially the same as that found in the Navy type 91 fuze. The aluminum alloy windshield adds form to the fuze and houses the upper end of the setback hammer. The time-setting ring, assembly ring, and lower fuze body are made of an aluminum alloy. The clockwork mechanism is housed in the time-setting ring and assembly ring. The time firing assembly consists of a primer cap under which is a black-powder flash channel leading to a small black-powder magazine in the base plug. The impact firing assembly consists of a stationary firing pin separated from a movable primer carrier by a

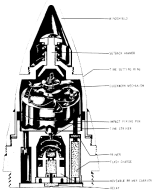


Figure 334—Type 100 Mechanical Time and Impact Fuze.

spring. Two spring-loaded detents are engaged in the slot of the primer carrier until the projectile is rotating in flight.

Operation:

Time: See Navy type 91.

Impact: Centrifugal force moves the detents from the slot in the primer carrier and the primer carrier is then free to overcome the spring and hit the fixed firing pin upon impact. A small black powder charge flashes to the base magazine which in turn fires the auxiliary detonating fuze. The Army auxiliary detonating fuze is used in conjunction with the type 100.

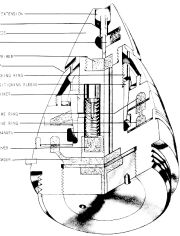


Figure 335—Type 2 Combination Powder Time and Impact Fuze.

Type 2 Combination Powder Time and Impact Fuze

Use: H. E. projectiles for the 75-mm and 105-mm antiaircraft guns.

Description:

Over-all length: $2\frac{3}{32}$ inches.
Maximum diameter: $3\frac{1}{8}$ inches.
Threaded length: $\frac{3}{8}$ inch.
Number of threads: 4, right-hand.

Construction: This fuze is constructed of brass and aluminum. The fuze body, time rings, vent positioning sleeve, and vent locking ring are made of brass, while the vent cap, nose piece, and base plug are of aluminum. The striker extension is wood.

The movable time train has setting markings from 1 to 44 seconds, in half-second intervals.

The vent positioning sleeve separates the time rings from the central fuze body, and vertical grooves in this sleeve allow the gases from the burning time rings to pass off. A key prevents the sleeve from turning, and the upper time ring is also held stationary by a key which threads into the central fuze body.

The vent locking ring threads on the central fuze body and secures the time rings and the sleeve. It is held off the upper ring by belleville springs. The ring is further secured by a grub screw.

The vent cap threads onto the upper time ring and contains holes for the escape of gases.

Contained in the nose cap is the complete impact firing mechanism, consisting of a wooden striker extension, striker, centrifugal detent, detent spring, and primer cap.

The fuze body has two longitudinal flash channels through its central part to allow the flash from the impact primer to ignite the black-powder magazine in the base. The time firing-pin safety spring, and time primer cap are also housed in the central fuze body. A transverse hole in the body between the time firing mechanism and the upper time ring allows the flash of the primer cap to ignite the upper time ring.

The fuze is stored with a protective cap screwed on the fuze body just below the lower time ring.

Operation:

Time: Set-back initiates the time striker. Because of four longitudinal grooves in the striker, the flash escapes to and through the transverse opening to the upper powder ring. From the lower powder ring a black powder flash channel ignites the black-powder magazine in the base.

Impact: The detent moves from under the striker with centrifugal force. On impact the nose is crushed, driving the striker onto the primer cap. The flash passes through the flash channel in the central fuze body to the black-powder magazine in the base.

Type 94 Small-Delay Base Fuze

Use: A.P.-H.E. projectiles for 37-mm tank and antitank guns.

Description:

Over-all length: No data.
Maximum diameter: 1 7/32 inches.
Threaded length: ½ inch.
Number of threads: 8, right-hand.

Construction: The fuze is made of one piece of black steel which houses the base plate, striker, arming sleeve, creep spring and firing train. The after end of the striker fits into a recess in the base plate and has an enlarged shoulder to engage the erming sleeve. A creep spring is housed in the arming sleeve resting between the primer housing and an inner shoulder of the arming sleeve. The striker is held from the primer by a shear wire which passes through the arming sleeve and the striker.

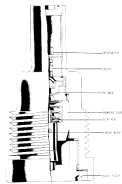


Figure 336—Type 94 Small-Delay Base Fuze.

Operation: On set-back the shear wire is broken. The arming sleeve moves back and is wedged on the after end of the striker, exposing the forward end of the striker beyond the forward end of the arming sleeve. On impact the striker and arming sleeve, which now act as one piece, move down against the creep spring with the striker, piercing the primer.

Type 92 Small Short-Delay Base Fuze

Use: A.P. projectiles for 57-mm tank guns.
Description:
Over-all length: $2\frac{9}{16}$ inches.
Maximum diameter: $1\frac{1}{4}$ inches.
Threaded length: $\frac{25}{32}$ inch.
Number of threads: 9.

Construction: Threaded onto the base of the fuze body is a metal cap which serves only as a cover for the centrifugal detents. Threaded into the forward section is the explosive train carrier.

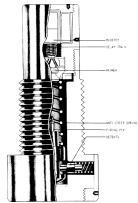


Figure 337—Type 92 Small Short-Delay Base Fuze.

The fuze body houses two centrifugal detents, a striker and a creep spring. The detents, fitting into a circular groove, hold the striker from the primer.

Operation: With centrifugal force the spring-loaded detents move out, leaving the striker free to move onto the primer on impact.

Small Mk 2 Base Detonating Fuze

Use: A. P. projectiles for the 47-mm antitank gun.

Description:
- Over-all length (with gaine): 2⅛ inches.
- Over-all length (without gaine): 1⁵⁄₁₆ inches.
- Maximum diameter: 1³⁄₁₆ inches.
- Threaded length: ⅝ inch.
- Number of threads: 9 right-hand.

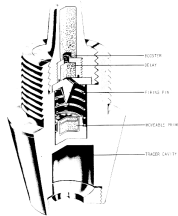


Figure 338—Mk 2 Small Base-Detonating Fuze.

Construction: This fuze is made of black steel in one piece. The rear end is drilled out to take the tracer. Housed in the forward part of the fuze and separated by a coiled spring, are a movable primer and a fixed firing pin. The firing pin contains a flash channel which leads to the explosive train. The gaine is threaded (R. H.) into the front of the fuze.

Operation: There are no arming features in this fuze. On impact, the primer moves down onto the firing pin. The resulting flash passes through a small hole beside the firing pin into the gaine.

Small Mk 1 Base Detonating Fuze

Use: Type 1 37-mm A. P. projectiles.
Description:
  Over-all length (with gaine): 2 1/16 inches.
  Maximum diameter: 1 3/32 inches.
  Threaded length: 7/16 inch.
  Number of threads: 7.

Construction: This fuze is identical to the small Mk 2 except for size.

Operation: The operation is the same as for the small Mk 2 fuze.

Figure 339—Mk 1 Small Base-Detonating Fuze.

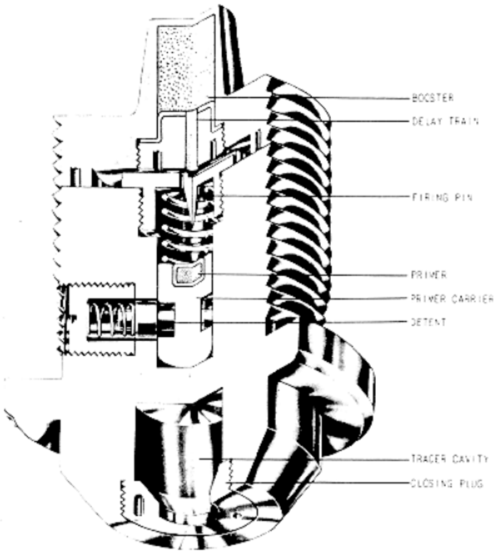


Figure 340—Mk 1 Medium Impact Base Fuze.

Medium Mk 1 Impact Base Fuze

Use: 75-mm A. P–H. E. projectiles for the type 41 and 94 mountain guns and the type 90 field gun.

Description:
- Over-all length (with gaine): No data.
- Over-all length (without gaine): 2 inches.
- Maximum diameter: $2\frac{1}{16}$ inches.
- Threaded length: $\frac{15}{16}$ inch.
- Number of threads: 11.

Construction: This fuze is made of black steel into two separate parts, which are threaded separately into the base of the projectile. The rear part contains a tracer element which is separated from the working mechanism of the fuze by a steel partition. The working mechanism consists of two spring-loaded detents which fit into a circumferential recess in the metal primer carrier and when in the unarmed position hold the primer carrier from the firing pin. There is a small coiled spring located between the firing pin and the primer carrier. The firing pin has two small flash channels leading down to the explosive gaine. The gaine threads into the fuze pocket with threads of the same diameter as the fuze proper.

Operation: Centrifugal force moves the detents out from the primer carrier, which is then separated from the stationary firing pin by the spring only. On impact, the primer moves down upon firing pin, flashing through the flash channels to the gaine.

Type 88 Small (Howitzer-Mortar) Base Fuze

Use: 12-cm A. P. projectile type 38 (howitzer)
and A. P. projectile for 150-mm howitzers.
Description:
Over-all length: 5½ inches.
Maximum diameter: 1⅜ inches.
Threaded length: $\frac{9}{16}$ inch, right-hand:

Construction: This fuze consists of an after section which houses the striker, centrifugal detents, and delay train, and a forward section housing the gaine. The base of the after section is threaded externally to thread into the base fuze carrier. The brass striker contains a circumferential groove into which two centrifugal detents are fitted. In flight a creep spring separates the striker from the

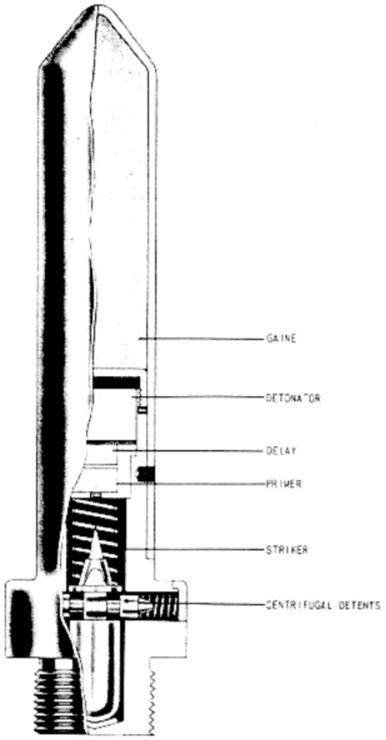


Figure 341—Type 88 Small (Howitzer-Mortar) Base Fuze.

primer. Resting between the base of the fuze and the after end of the striker is a lead disc, the purpose of which is to prevent freezing of the striker to the fuze body on setback. Housed in the center portion of the fuze are the primer, delay pellet, and detonator.

Operation: With centrifugal force the detents move out, freeing the striker, which moves down against the creep spring on impact.

Type 88 Small (Gun) Base Fuze

Use: A. P.-H. E. for 15-cm guns.
Description:
Over-all length: $6\frac{21}{32}$ inches.
Maximum diameter: $1\frac{3}{8}$ inches.
Threaded length: $\frac{7}{8}$ inch.
Number of threads: 6.

Construction: This fuze has the same internal construction as the type 88 small base fuze (howitzer-mortar type). It differs externally in that it is slightly longer than the howitzer-mortar type and has a square top instead of a conical top.

Operation: The operation is the same as for the howitzer-mortar type fuze.

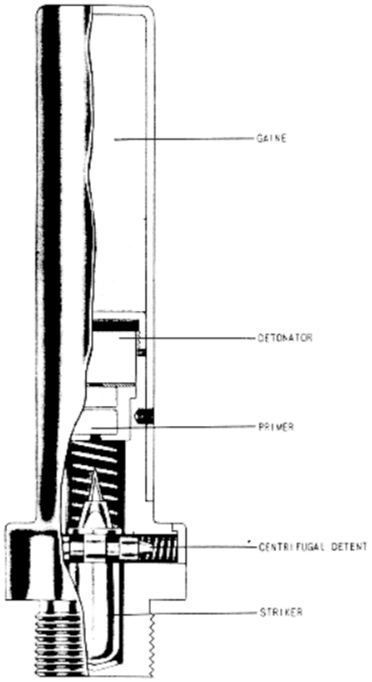


Figure 342—Type 88 Small (Gun) Base Fuze.

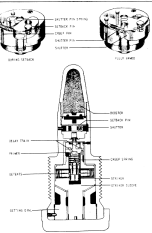


Figure 343—Type 95 Large Mk 2 Mod 1 Base Fuze.

Type 95 Large Mk 2 Mod 1 Base Fuze

Use: A. P.-H. E. projectile for 7th year type 30-cm howitzer.

Description:

Over-all length: 8 inches.
Length (without gaine): 5⅜ inches.
Maximum diameter: 2⅛ inches.
Threaded length: 2 inches.
Number of threads: 12, right-hand.

Construction: The fuze body is threaded externally to fit into the base plate and internally to receive the setting-dial piece in the base and the gaine in the forward end. Within the fuze body are housed the striker sleeve, centrifugal detents, striker, creep spring, primer, delay train, and shutter.

The striker sleeve is operated externally from the base of the fuze by the setting dial and controls the position of a powder time ring which in turn determines the amount of delay. The striker

rests on a creep spring and has a circumferential groove into which the centrifugal detents fit. The shutter housing is held in the fuze body by the gaine. The shutter slide is held in place (thus interrupting the firing train) by two horizontal spring-loaded pins, one end of which is threaded to the shutter slide and the other end anchored to the shutter housing. There is a spring-loaded set-back pin housed in the shutter proper to provide bore safety.

Operation: When the projectile is fired, the setback pin housed in the shutter moves down against its spring into the shutter housing locking the shutter to the housing. As deceleration begins, the setback pin moves into the shutter and frees it to move out. With centrifugal force, the shutter slide moves out, compressing the springs of the two horizontal pins, and presents a flash hole which opens the firing train. As creep sets in, two vertical pins move forward to lock the shutter slide pins in place and hold the shutter slide in the open position.

The centrifugal detents holding the striker move out, freeing the striker, which moves down onto the primer on impact.

Remarks: The setting dial is graduated from 5 to 200, representing 0.05 to 2 seconds delay.

Figure 344—Type 95 Medium Base Fuze.

Type 95 Medium Base Fuze

Use: Type 95, 15 cm. A. P.–H. E.
Description:
Over-all length: 5$\frac{35}{64}$ inches.
Maximum diameter: 2$\frac{23}{64}$ inches.
Threaded length: $\frac{25}{32}$ inch.
Number of threads: 6.

Construction: This fuze is similar to the type 95 large Mk 2 Mod 1 base fuze, but it is smaller in length and diameter. There is no threaded cap over the base as in the large fuze, and the firing-pin sleeve is of different construction.

The firing pin, detents, shutter, and setting dial are of similar construction in both fuzes.

Operation: The operation of the fuze is identical to that of the type 95 large Mk 2 Mod 1 fuze. The fuze is armed by setback and centrifugal force, and fires upon impact.

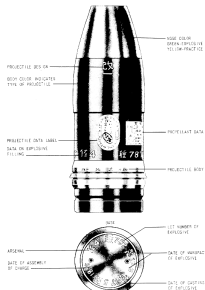


Figure 345—Markings of Japanese Navy Projectiles.

Chapter 5

NAVY AMMUNITION

COLOR SYSTEM FOR LARGE-CALIBER PROJECTILES

The Navy system of marking projectiles for all sizes over 40-mm is relatively simple and reasonably consistent. Some discrepancies exist between the standard system and recovered specimens.

The following system applies to projectiles of over 40-mm, but carries over in part into the marking of smaller-caliber ammunition.

Body color: The main color of the projectile body indicates the basic type of shell.

Type of projectile	Body color
Japanese "ordinary"*	Maroon.
Armor-piercing	White.
Illuminating (over 14-cm).	Red.
Illuminating (under 14-cm).	Blue.
Shrapnel	Gray.
Target	Green.
Smoke tracer	Orange.
Practice	Black.
Incendiary-shrapnel	Red with identifying characters.

*Japanese classification "Ordinary" includes Common and capped Common projectiles as well as various designs of H. E. projectiles.

Color of nose: Certain additional information is indicated by the painting of the nose of the projectile as follows:

1. Green Nose.—Indicates "explosive-filled." Specific identity of explosive is not made. Black Powder as well as H. E. is marked in this way.

2. Red Tip on Green Nose.—Indicates "base-fuzed," but is not used when ammunition is of the fixed type.

3. Yellow Nose.—Indicates "practice use." This is applied to standard practice projectiles, painted black, and may also be used to indicate projectiles converted from service types. Projectiles converted for practice retain their original painting except for the yellow nose.

The length of the green or yellow tip is 100 mm for 12-cm gun and larger, 50 mm for 10- and 8-cm guns, 15 mm for 6-cm and smaller.

The length of the red tip is exactly half that of the green.

Center of gravity: The center of gravity of larger projectiles is indicated by a color band painted at the appropriate position near the middle of the body. The color of this band is varied to contrast with the color of the projectile body.

Color of projectile body	Color of band	Width of band
Maroon or blue.	Yellow	50 mm for projectiles 20-cm and above.
White	Red	20 mm for 15.5 (and under).
Black	White	10 mm on all sizes.

The center of gravity is not required to be marked on projectiles of 15-cm and under, but where projectiles of these sizes already bear the color band at the point of balance (apparently from earlier requirements) repainting is not required.

Additional features of painting:

1. A black band painted on the lower edge of a projectile cap indicates a design of cap designated "type 3-year cap."

2. Fuzes and rotating bands normally are not painted. The bourrelet is consistently painted.

3. The portion of the body between the rotating band and the base is left unpainted in projectiles of fixed ammunition, but is painted on projectiles of semi-fixed ammunition.

4. Dummy plugs resembling fuzes have the tips painted with black lacquer to distinguish them from fuzes.

Accessory markings: Type numbers or other characters are sometimes stenciled on the ogival portion of the projectile as a further aid in identification. Some of these markings are:

a.	九一	"91" indicating type 91 projectile design.
b.	八八	"88" indicating type 88 projectile design.
c.	五号	"Mk 5" indicating Mk 5 projectile design.
d.	改一	"Modification 1" referring to projectile design, but not a complete identification.
e.	焼霰	"Incendiary shrapnel."
f.	乙	"B" (rare) indicating a variation in explosive charge—presumably type "B" explosive.
g.	教練用	"For practice use."
h.	特減用	"For use with special reduced charge."

Filling data: On Navy projectiles of the larger sizes (8-cm and above), the dates of manufacture and filling are painted or stencilled around the body of the projectile just above the rotating band, and again on the base of the projectile.

This marking usually consists of the following data in sequence as given (beginning at the right of the widest space and reading around the projectile to the right).

a.	種	"Lot" followed by an entry like #72, M24, or 787 indicating the lot of explosive as manufactured.
b.	製	"Manufactured" with a date like 17–3 (shows 17th year, 3d month or March 1942).
c.	鑄	"Cast" followed by a date as above, to indicate the date the preformed block of explosive was cast.
d.	裝	"Assembled" followed by a date, indicating the date the block was installed in the projectile. This entry is sometimes omitted or incorporated into the Arsenal identification.

e. An Arsenal Identification. This entry is not well standardized.

横 5	"Yoko 5" a Yokosuka Arsenal.
佐 4	"SA 4" a Sasebo Arsenal.
呉 18-21	"Kure February 1943" The date of assembly at Kure.

Rotating band marking: Certain information pertaining to the manufacture of the projectile body itself is stamped into the rotating band. A typical example follows:

改一 5/16 ⚓ 18.500

a. "Modification One" applies to the projectile design but is not a complete designation. This sometimes appears as " ⊖ ."

b. 5/16 indicates 5th month, 16th year Showa (May 1941), the date of manufacture of the projectile body.

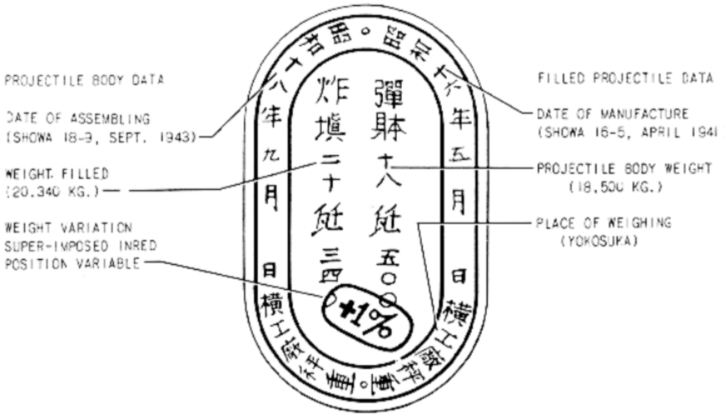
c. ⚓ Symbol of the place of manufacture, in this case Kure. The form of the anchor varies with each factory. The place name or its abbreviation (e. g. 呉 Kure: or 佐 Sa for Sasebo) may also be included.

d. 18.500 is the weight of the empty projectile body in kilograms. This may also be written 18 K 500.

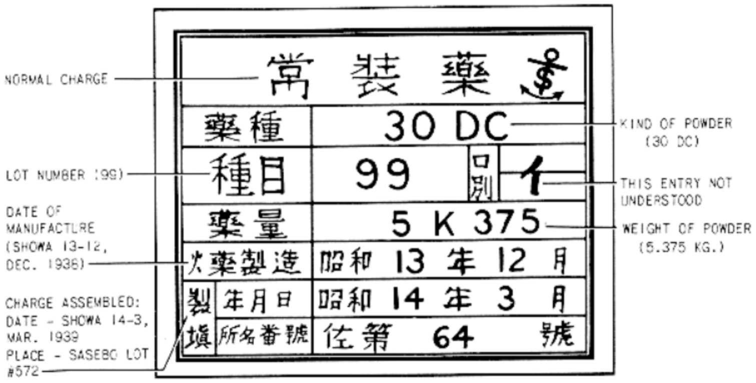
Paper labels: Typically, but not without exception, there are two paper labels appearing externally on Navy ammunition, an oval one giving projectile data, and a square one giving propellant data. Both carry valuable information on the ammunition components, and may be read at least partially without knowledge of Japanese.

In fixed ammunition both labels appear on the projectile. In semi-fixed ammunition, the oval label appears on the projectile and the square propellant label is glued to the metal disc in the top of the propellant case. In both types, the propellant label is duplicated by a cloth label sewed to the bag enclosing the powder sticks.

Projectile data label:



Propellant label:



常 裝 藥			
藥種	30 DC		
種目	99	口別	イ
藥量	5 K 375		
火藥製造	昭和 13 年 12 月		
製填 年月日	昭和 14 年 3 月		
製填 所名番號	佐第 64 號		

Occasionally the designation of the gun is included on the cloth label which is sewed to the propellant bag or may appear on a separate small label sewed near the propellant label.

Examples:

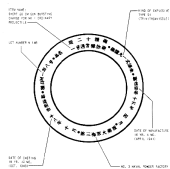
'40 cal. 12.7 High-Angle Gun"

"Short 5-cm Gun"

Bursting charge label: The bursting charge for most Navy projectiles is cast in a paper container and inserted in the projectile as a separate unit and is held in place by paraffin.

A circular label on the bottom of the explosive charge carries the following data:

1. Identification of the gun (type number, etc.).
2. Identification of the projectile (type number, etc.).
3. Kind of explosive:
   a. Shimose (picric acid) - - - - - - -
   下瀬爆薬
   b. Type 91 explosive (trinitroanisole) - -
   九一式爆薬
   c. Type 92 explosive (TNT) - - - - - - - -
   九二式爆薬
4. Lot number of explosive.
5. Date of manufacture of explosive.
6. Date of casting of the explosive block.


ITEM NAME:
SHORT 20 CM GUN BURSTING CHARGE FOR MK I ORDINARY PROJECTILE
KIND OF EXPLOSIVE
TYPE 91
(TRINITROANISOLE)
LOT NUMBER M 148
DATE OF MANUFACTURE
16 YR. 4 MO.
(APRIL 1941)
DATE OF CASTING
18 YR. 10 MO.
(OCT. 1943)
NO. 3 NAVAL POWDER FACTORY

COLOR SYSTEM FOR SMALL-CALIBER PROJECTILES

Certain features of marking of large-caliber projectiles carry over into the marking of smaller sizes, but in general, sizes of 40-mm and under follow no single standard identification system and are best considered as individual groups.

40-mm—Automatic antiaircraft weapon: This ammunition follows the large-caliber system in general.

Maroon with green tip: High explosive.
White with green tip: Armor-piercing (H. E. filled).
Orange: Tracer (blind loaded).

30-mm—Aircraft cannon: This ammunition follows a system independent of the large-caliber code, but common to 20-mm Navy ammunition, which is likewise for aircraft cannon. Color of projectile body indicates type of projectile.

Maroon: High explosive.
Red: H. E. tracer.
Yellow (greenish): H. E. I. (W. P.).
Black with red nose, fuzeless: Tracer.
White: Armour-piercing.

A new trend in the painting of 30-mm projectiles is to leave the body unpainted except for an identifying color band immediately behind the nose fuze.

25-mm—Automatic antiaircraft weapon: This ammunition follows the large-caliber system in part. Green tipping to indicate the presence of explosive filling was followed in H. E. and H. E.-tracer projectiles of earlier manufacture, but apparently has been abandoned in more recent lots.

Maroon (with or without green tip): High explosive.
Red (with or without green tip): H. E., tracer. Later lots only are self-destroying.
Orange (with or without green tip): H. E., tracer. Identical to red non-S. D. rounds.
Orange (with red paint around the case primer): H. E., tracer. Construction of tracer differs from above.
Green: H. E. I. (W. P.).
White (with black under coat): A. P.-T. Projectiles sometimes appear bluish-white, white-tipped, or black due to loss of white paint.

20-mm—Aircraft cannon Mk 1 and Mk 2: Color of body indicates type of projectile. White bands indicate modifications of basic design.

No bands: Un-modified design.
One band: Modification one.
Two bands: Modification two.
Three bands: Modification three.
One wide band: Modification four.
Brown: High explosive.
Red (solid nose): Tracer.
Red (fuzed): H. E. tracer.
Yellow (greenish): H. E. I. (W. P.).
White: A. P. I. (dry filling).
Black: Practice, blind loaded.

13-mm—Type 2 aircraft machine gun (fuzed ammunition): Color of body indicates type of projectile; follows aircraft cannon code.

Maroon (fuzed): High explosive.
Red (fuzed) brown band: H. E. T.
Red (fuzeless): Tracer.
Yellow (fuzed): H. E. I. (W. P.).
White (fuzeless): A. P.-T.
Black (fuzeless): Practice.

Small arms—7.7-mm, 7.9-mm, 13.2-mm: Identifying color is applied around the primer in the base of the case.

Black: Ball.
Red: Tracer.
White: Armor-Piercing.
Green: Incendiary Model 1 (W. P.).
Purple: Incendiary Model 2 (H. E.).

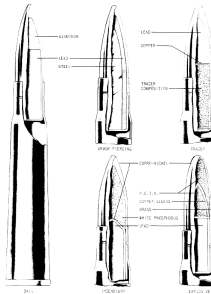


Figure 346—7.7-mm Aircraft Machine Gun Ammunition.

Chapter 5—Section 1

NAVY PROJECTILES

7.7-mm Aircraft Machine Gun Ammunition

	Ball	A. P.	Incendiary	Tracer	H. E.
Over-all length	$3\frac{1}{32}$ inches	$3\frac{5}{64}$ inches	$3\frac{3}{64}$ inches	$3\frac{5}{64}$ inches	3 inches.
Length of case	$2\frac{7}{32}$ inches	$2\frac{7}{32}$ inches	$2\frac{7}{32}$ inches	$2\frac{7}{32}$ inches	$2\frac{7}{32}$ inches.
Length of projectile	$1\frac{9}{32}$ inches	$1\frac{13}{32}$ inches	$1\frac{13}{32}$ inches	$1\frac{13}{32}$ inches	$1\frac{21}{64}$ inches.
Weight of projectile	173.6 grams		133.2 grams	130.4 grams.	

Type	Projectile jacket	Projectile core
Construction:		
Ball	CuNi	Lead.
A. P.	Brass	Steel.
Tracer	CuNi	Lead.
Incendiary	Brass	W. P. and lead.
H. E. (blunt nose).	Copper	PETN and lead.

Weapons in which used:
- Type 92 A. A. M. G. (Lewis design).
- Type 92 flexible A. C. M. G. (Lewis design).
- Type 97 fixed A. C. M. G. (Vickers design).

Type	Primer color
Color and markings:	
Ball	Black.
A. P.	White.
Tracer	Red.
Incendiary	Green.
H. E.	Purple.

Remarks: This ammunition is used in Navy aircraft. There is no sequence of loading.

All the rounds are rimmed. They are interchangeable with British caliber 303.

The type 92 A. A. M. G. and A. C. M. G. uses a drum magazine, and the type 97 uses a link belt feed.

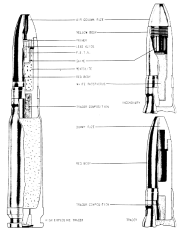


Figure 347—13-mm Aircraft Machine Gun Ammunition.

13-mm Aircraft Machine Gun Ammunition

	Tracer	A. E. T.	Incendiary
Over-all length	4⅛ inches	4⅛ inches	4⅛ inches.
Length of case	2½ inches	2½ inches	2½ inches.
Length of projectile (without fuze)	$1\frac{37}{64}$ inches	$1\frac{37}{64}$ inches	$1\frac{37}{64}$ inches.
Weight of projectile (empty)	27.2 grams	24.6 grams	24.3 grams.

Construction:

Type	Projectile jacket	Projectile core
Ball	Copper	Lead.
A. P. T	Copper	Steel.
Tracer (dummy fuze plug).	Copper	Lead.
Incendiary	Copper	W. P. and lead.
H.E.T.(fuzed)	Copper	PETN and lead.
H. E. (fuzed)	Copper	PETN and lead.

Weapon in which used: Type 2 A. C. M. G. (copy of German 13-mm Rheinmetall-Borsig).

Color and markings:

Type	Body color
Ball	Black.
A. P. T.	White.
Tracer	Red.
Incendiary	Yellow.
H. E. T.	Red with brown band.
H. E.	Maroon (rust).

Remarks: This ammunition has a reduced-rim brass case with a shoulder above the extractor groove. All rounds have a nose fuze or a dummy fuze plug.

The body of the projectiles are painted in distinctive colors after the system used in 20-mm aircraft cannon ammunition.

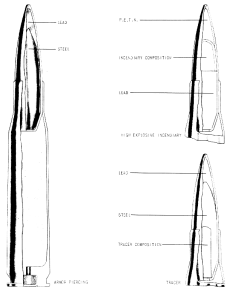


Figure 348—13.2-mm Aircraft and Antiaircraft Machine Gun Ammunition.

13.2-mm Aircraft and Antiaircraft Macine Gun Ammunition

	Tracer	A. P.	H. E. I.
Over-all length	5⅜ inches	5⅜ inches	5⅜ inches.
Length of case	3⅞ inches	3⅞ inches	3⅞ inches.
Weight of projectile (empty)	44.8 grams	51.8 grams	44.3 grams.

Construction:

Type	Projectile jacket	Projectile core
Ball	Copper	Lead.
Tracer	Copper	Lead.
A. P.	Copper	Steel.
H. E. I.	Copper	PETN and incendiary composition.

Weapons which used:

Type 93: A. A. M. G.
Type 3: Fixed/flexible A. C. M. G.

Color and markings:

Type	Color around primer
Ball	Black.
Tracer	Red.
A. P.	White.
H. E. I.	Yellow.

Remarks: This ammunition has a rimless brass case. It is very similar in appearance but not interchangeable with U. S. cal. .50.

The standard Navy code for marking small arms ammunition is used.

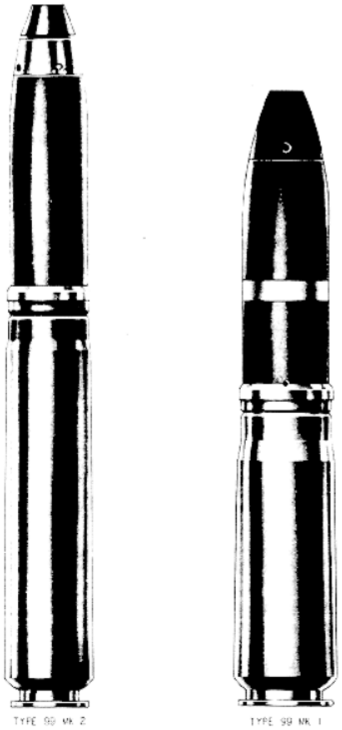


Figure 349—Type 99 20-mm Ammunition.

Type 99 20-mm Ammunition

Naval 20-mm ammunition is divided into two classes: Type 99 Mk I and type 99 Mk II. The two are distinguished by the fact that the Mk I uses a small-size cartridge case (3.79 in.), and the Mk II uses a large-size cartridge case (3.98 in.).

Both sizes use the same projectiles and fuzes, but there are a greater number of types and modifications of rounds in the smaller size.

This ammunition is a Japanese copy of the Swiss Oerlikon design. In addition to rounds of Japanese make, some of Swiss origin have been used by the Japanese.

Case	Mk I	Mk II
Length	3.79 inches	3.98 inches.
Diameter at base	0.75 inch	0.75 inch.
Weight (empty)	57.0 grams	71.0 grams.
Material	Brass	Brass.

The cases are of the reduced-rim type and are crimped to the projectiles by either three or six crimps at the cannelure, and sealed with a clear lacquer.

Propellant: The propellant from the Japanese-manufactured rounds is graphited, single-base, single perforated, cylindrical, nitrocellulose grains. The propellant from the Swiss rounds is single-base, graphite-coated, nitrocellulose grains, in the form of flakes. The Mk I case contains 13.6 grams of propellant and the Mk II case contains 21.4 grams of propellant.

Projectiles: In the case of Japanese manufactured ammunition, the type of projectile is indicated by painting the projectile body a solid color. Subsequent modifications of the original type are indicated by one or more white bands around the projectile body, thus:

Original type: No bands.
Modification 1: One 5-mm white band.
Modification 2: Two 5-mm white bands.
Modification 3: Three 5-mm white bands.
Modification 4: One 10-mm white band.

All the Swiss projectiles are painted a solid color without bands.

The following dimensions are common to all projectiles:

Distance from rotating band to bourrelet, 1.29 inches.
Distance from rotating band to base, 0.36 inch.
Diameter of body, 0.77 inch.
Diameter at bourrelet, 0.79 inch.
Diameter at base, 0.75 inch.
Diameter at rotating band, 0.83 inch.

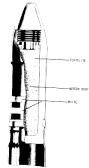


Figure 350—20-mm High-Explosive Projectile.

20-mm High-Explosive Projectile

Weight of projectile (fuzed): 4.50 ounces.

Length of projectile (fuzed): 3.23 inches.

Length of complete round: MK I, 5.66 inches, MK II, 6.84 inches.

Filling: Pentolite (50 percent TNT, 50 percent PETN).

Weight of filling: 0.35 ounces.

Fuzing:
  Japanese: Mod 2.
  Swiss: Mod 1.

Color and markings:
  Japanese: Rust brown over-all (modifications indicated by white bands).
  Swiss: 1. Yellow over-all. 2. Dark brown over-all.

Remarks: Ammunition of Swiss manufacture has been found to contain slightly more explosive than the Japanese round.

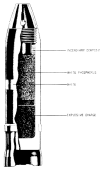


Figure 351—20-mm High-Explosive Incendiary Projectile.

20-mm High-Explosive Incendiary Projectile

Fuzing:
- Basic projectile: Model 1.
- Modification I: Model 1.
- Modification II: Model 3.
- Modification III: Model 2.
- Modification IV: Model 3.

Weight of projectile (fuzed): 4.51 ounces.

Length of projectile (fuzed): 3.23 inches

Length of complete round: MK I, 5.66 inches; MK II, 6.84 inches.

Filling:
- TNT: 0.18 ounces.
- WP: 0.11 ounces.
- Incendiary mixture: 0.04 ounces.

Color and markings: Greenish-yellow over all, with one or more white bands to indicate modifications

Remarks: The body of all projectiles (basic and modifications) is of steel, with one cavity. The base of the cavity contains TNT, above which is an aluminum cannister containing white phosphorus. The cannister is surrounded by a graphited, flake nitrocellulose incendiary mixture. The Model 4 projectile eliminates the TNT and has a longer white phosphorus cannister.

Differences between the basic projectiles and subsequent modifications are principally in the fuzes and slight changes in the shape of the cavity.

20-mm High-Explosive Tracer Projectile

Fuzing:
- Basic projectile: Model 1.
- Modification I: Model 1.
- Modification II: Model 1.
- Modification III: Model 2.
- Modification IV: Model 3.
- Modification V: Two-piece fuze. (Japanese designation unknown).

Weight of projectile (fuzed): 4.51 ounces.

Length of projectile (fuzed): 3.10 inches.

Length of complete round: Mk I, 5.70 inches* Mk II, 6.88 inches.

Filling: Pentolite (50 percent TNT, 50 percent PETN).

Weight of filling: 0.18 ounce.

Color and markings: Red over all (modifications indicated by white bands).

Remarks: The body of all these projectiles (basic and five modifications) contains two cavities separated by a steel septum. The upper cavity contains the H. E. filling, while the lower contains the tracer. The same H. E. filling and tracer mixture are used in all instances. Differences between the basic projectile and subsequent modifications are principally in the fuzes and weight of H. E. and tracer filling used.

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*The No. Model and Model 1 projectiles are 0.16 inch shorter than the other rounds.

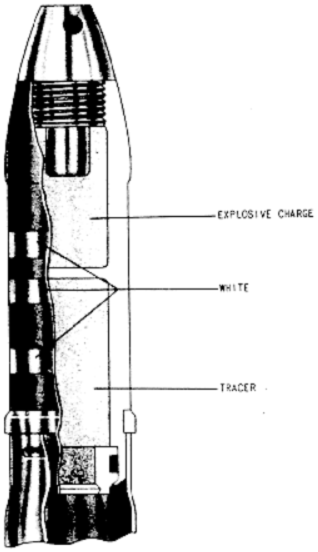


Figure 352—20-mm High-Explosive Tracer Projectile.

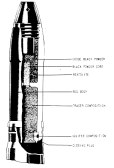


Figure 353—20-mm High-Explosive Tracer (Self-Destroying) Projectile.

20-mm High-Explosive Tracer (Self-Destroying) Projectile

Fuzing: Model 1.
Weight of projectile (fuzed): 4.50 ounces.
Length of projectile (fuzed): 3.15 inches.
Length of complete round: Mk I, 5.58 inches; Mk II, 6.76 inches.
Filling: Pentolite (50 percent TNT, 50 percent PETN).
Weight of filling: 0.15 ounce.
Color and markings: Japanese, red over all; Swiss, black over all.

Remarks: The projectiles are similar to the H. E. tracer types except for their self-destroying feature, which is accomplished by a hole drilled through the septum of the projectile. A black-powder train leads from the tracer, through the hole in the septum and the H. E. filling, to the base of the gaine.

20-mm Armor-Piercing Incendiary Projectile

Fuzing: None.
Weight of projectile: 4.64 ounces.
Length of projectile: 3.15 inches.
Length of complete round: Mk I, 5.58 inches; Mk II, 6.76 inches.
Filling: Incendiary mixture:

1. Nitrocellulose: 77.5 percent.
2. Sodium nitrate: 11.3 percent.
3. Aluminum: 11.2 percent.

Weight of filling: 0.12 ounce.
Color and markings: White over-all.

Remarks: The projectile is unfuzed and has a pointed steel body and a soft copper cap soldered to the nose. The incendiary filling loaded through the base is sealed with a threaded base plug.

Upon impact, the rear end of the projectile ruptures and the heat generated ignites the incendiary filling.

No modifications or similar Swiss ammunition exist.

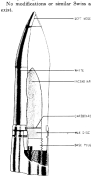


Figure 354—20-mm Armor-Piercing Incendiary Projectile.

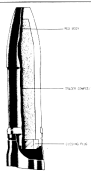


Figure 355—20-mm Tracer Projectile.

20-mm Tracer Projectile

Fuzing: None.
Weight of projectile: 4.44 ounces.
Length of projectile: 3.23 inches.
Length of complete round: Mk I, 5.66 inches; Mk II, 6.84 inches.
Filling: Tracer mixture.
Weight of filling: 0.31 ounce.
Color and markings: Red over all (modifications indicated by white band).

Remarks: The projectile is unfuzed; has a blunt nose and a long cavity containing the tracer element. It is loaded so as to be the first round fired to break the muzzle cover. It is, therefore, often referred to as a "bag-buster."

In addition to the basic Japanese type, Modifications II and III exist, as well as a similar round of Swiss make. The weight of tracer constitutes the difference in the Japanese modifications.

20-mm Practice Projectile

Fuze: None.
Weight of projectile: 4.45 ounces.
Length of projectile: 3.23 inches.
Length of complete round: Mk I, 5.66 inches; Mk II, 6.84 inches.
Filling: None.
Color and markings, black over all.

Remarks: The projectile is unfuzed and has a blunt nose. It has an empty cavity which is closed at the base with a crimped steel plug. No modifications exist.

Figure 356—20-mm Practice Projectile.

Figure 357—25-mm Ammunition.

25-mm Ammunition

The only 25-mm gun in use by the Japanese was the type 96 Model 2 antiaircraft/antitank gun. This is a multiple-barreled, air-cooled, magazine-fed, automatic weapon.

Case: The case is rimless; has a slight taper and a pronounced neck, which is crimped over the after rotating band of the projectiles.

Length: 6.46 inches.
Diameter of base: 1.65 inches.
Material: Brass.
Weight (empty); 333.5 grams.

Propellant: The propellant is single-perforated, graphited grains of nitrocellulose. The grains are 2 mm in diameter and from 2.5 mm to 4.5 mm in length. The propellant weight is 102 grams.

Projectiles: The type of projectile is indicated by painting the projectile body a solid color.

The following dimensions are common to all projectiles:

Projectile diameter: 0.96 inch (24.5 mm).
Width of rotating bands:
  Forward: 0.71 inch.
  Aft: 0.24 inch.

25-mm High-Explosive Projectile

Fuzing: Model 1 or Model 4.
Weight of projectile, filled (without fuze): 7.04 ounces.
Weight of projectile filling: 54 ounces.
Fillings:
  Standard: TNT, 66 percent; aluminum, 34 percent.
  Alternates: 1. Cast TNT; 2. Tetryl.
Color and markings: Maroon over all.
Dimensions:
  Length of projectile (without fuze): 3.58 inches.
  Length of assembled round: 8.27 inches.

Figure 358—25-mm High-Explosive Projectile.

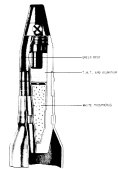


Figure 359—25-mm High-Explosive Incendiary Projectile.

25-mm High-Explosive Incendiary Projectile

Fuzing: Model 1 or Model 4.
Weight of projectile, filled (without fuze): 7.17 ounces.
Length of projectile (without fuze): 3.58 inches.
Length of complete round: 8.27 inches.
Filling:
  TNT and aluminum: 0.20 ounce.
  White phosphorous: 0.47 ounce.
Weight of projectile filling: 0.67 ounce.
Color and markings: Green over all.

25-mm High-Explosive Tracer Projectile

Fuzing: Model 1 or Model 4.
Weight of projectile (approximately) filled (without fuze): 4.16 ounces.
Length of projectile (without fuze): 3.43 inches.
Length of assembled round: 8.24 inches.
Weight of projectile filling (including tracer): 0.72 ounce.
Fillings: H. E. T.
  Standard: Three pellets of TNT and aluminum
  Alternates: 1. Three pellets of TNT. 2. Cast or pressed tetryl.
Color and markings: Orange or red over all.

Remarks: The only discernible difference between the orange and red rounds is a slight disagreement in weight.

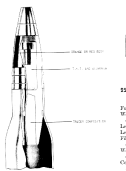


Figure 360—25-mm High-Explosive Tracer Projectile.

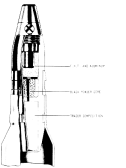


Figure 361—25-mm High-Explosive Tracer (Self-Destroying) Projectile.

25-mm High-Explosive Tracer (Self-Destroying) Projectile

Fuzing: Model 1 or Model 4.
Weight of projectile, filled (without fuze): 4.16 ounces.
Length of projectile (without fuze): 3.43 inches.
Length of complete round: 8.24 inches.
Filling: TNT and aluminum with a black powder core in the lower pellet.
Weight of projectile filling (including tracer): 0.72 ounce.
Color and markings: Red over all.

Remarks: There is no external marking to distinguish the self-destroying rounds from those that are not self-destroying.

Figure 362—25-mm Armor-Piercing Projectile.

25-mm Armor-Piercing Projectile

Fuzing: None.
Weight of projectile, filled: 8.88 ounces.
Length of projectile: 3.93 inches.
Length of assembled round: 8.74 inches.
Filling:
  Tracer: Sodium nitrate, magnesium and barium peroxide.
  Inert material: Kieselguhr (chiefly dry clay).
Weight of projectile fillings:
  Inert material: 1.25 ounces (3.53 grams).
  Tracer: 3.05 ounces (8.64 grams).
Color and markings: Black, white, or smoky blue over all.

Remarks: This projectile is listed in Japanese documents as armor-piercing, although the metal is softer than that used in smaller A. P. rounds.

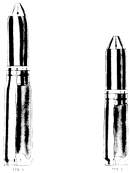


Figure 363—30-mm Ammunition.

30-mm Ammunition

Two 30-mm aircraft cannon, the type 2 and the type 5, were in use by the Japanese. These guns are of Oerlikon design and use similar ammunition. The type 5 gun uses a longer case and a slightly heavier projectile than the type 2 gun.

Case: The case for the type 2 gun is of typical Oerlikon design. It is a comparatively short brass reduced-rim case slightly necked.

The case for the type 5 gun is longer, has a more pronounced neck, and is of the rimless type.

	Type 2	Type 5
Length of case	3.58 inches.	4.81 inches.

Projectiles: Like the 20-mm ammunition, the type of projectile is indicated by painting the projectile body a solid color. However, some of the type 5 projectiles were unpainted except for a narrow band behind the nose fuze.

The following dimensions are common to all projectiles:

	Type 2	Type 5
Diameter at bourrelet	1.18 inches.	1.18 inches.
Width of rotating band	0.24 inch	0.31 inch.

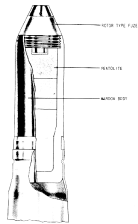


Figure 364—30-mm Type 5 High-Explosive Projectile.

30-mm Type 5 High-Explosive Projectile

Fuzing: Rotor type fuze.
Length of projectile (without fuze): 3.53 inches.
Length of complete round: 8.31 inches.
Filling: Pentolite.
Color and markings: Maroon over all.

Remarks: The pentolite is in a precast block surrounded by cardboard.

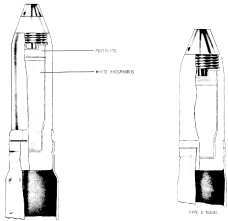


Figure 365—Type 2 and Type 5 30-mm High-Explosive Incendiary Projectile.

30-mm Type 2 and Type 5 High-Explosive Incendiary Projectiles

Fuzing: Rotor type fuze.

	Type 2	Type 5
Length of projectile, (without fuze)	2.83 inches.	3.53 inches.
Length of assembled round (fuzed)	6.57 inches.	8.31 inches.

Weight of filling (type 2):
  Pentolite: 3.56 grams.
  White phosphorus: 19.94 grams.

Filling: Pentolite and white phosphorus.

Color and markings: Greenish-yellow over all. The type 5 projectile is sometimes unpainted except for a greenish-yellow band at the nose.

Remarks: The one-piece projectile contains only one cavity. The H. E. is surrounded by a cardboard below which is contained the W. P. in a metal canister.

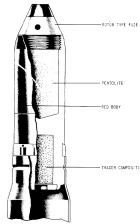


Figure 366—Type 5 30-mm High-Explosive Tracer Projectile.

Type 5 30-mm High-Explosive Tracer Projectile

Fuzing: Rotor type fuze.

Length of projectile (without fuze): 3.53 inches.

Length of complete round: 8.31 inches.

Filling: Pentolite.

Color and markings: Red over all or a red band at the nose.

Remarks: The body of the projectile contains two cavities separated by a steel septum. The upper cavity contains the H. E. filling, while the lower contains the tracer.

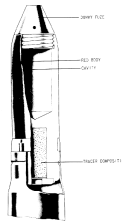


Figure 367—Type 5 30-mm Tracer Projectile.

Type 5 30-mm Tracer Projectile

Fuzing: Nose plug.
Length of projectile (without fuze): 3.53 inches.
Length of complete round: 8.31 inches.
Filling: None.
Color and markings: Red over all or a red band at the nose.

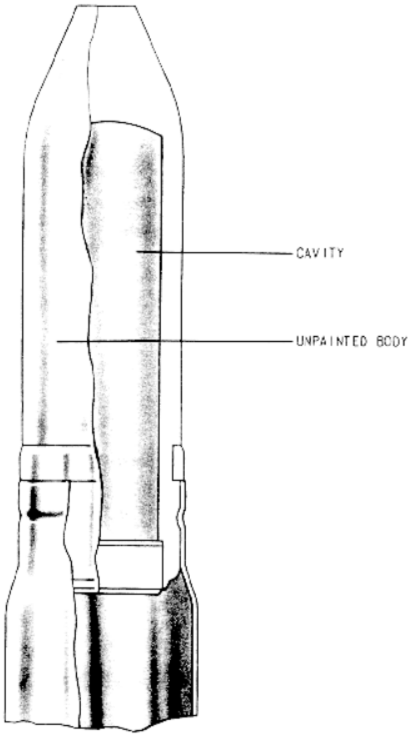


Figure 368—Type 2 and Type 5 30-mm Practice Projectile.

Type 2 and Type 5 30-mm Practice Projectiles

Fuzing: Dummy fuze.

	Type 2	Type 5
Length of projectile (without fuze)	2.83 inches	3.53 inches.
Length of assembled round (fuzed)	6.57 inches	8.28 inches.

Filling: Blind loaded.

Color and markings:

Type 2: Black over all with red dummy fuze.
Type 5: Not painted.

Remarks: The projectile body and case are the same in appearance as the H. E. I. round.

This is used as the first round in the magazine, clear the gun bore.

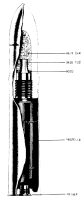


Figure 369—40-mm Armor-Piercing Projectile.

40-mm Armor-Piercing Projectile

Weight of complete round (without fuze): 1.17 kg. (2.57 pounds).
Weight of projectile, filled (without fuze): 0.78 kg. (1.82 pounds).
Weight of filling: 0.023 kg.
Filling: Cast TNT.
Diameter at bourrelet: 1.57 inches.
Length of projectile (without fuze): 5.24 inches.
Length of assembled round: 10.33 inches.
Length of propellant case: 6.18 inches.
Width of rotating band: 0. 63 inch.
Diameter of base of propellant case: 1.89 inches.
Fuzing: Small A/P base fuze.
Propellant: Cylindrical lengths of smokeless powder, 95.9 grams.
Color and markings: White, green tip.

Remarks: This round indicates use of the 40-mm Vickers-Armstrong as a dual-purpose gun.

40-mm High-Explosive Antiaircraft Projectile

Weight of complete round (without fuze): 1.18 kg. (2.50 pounds).
Weight of projectile, filled, (without fuze): 0.79 kg. (1.74 pounds).
Weight of filling of projectile: 0.07 kg.
Filling: Cast TNT.
Diameter at bourrelet: 1.57 inches.
Length of projectile (without fuze): 5.01 inches.
Length of assembled round (without fuze): 10.40 inches.
Length of propellant case: 6.18 inches.
Width of rotating band: 0.63 inch.
Diameter of base of propellant case: 1.89 inches.
Fuzing: A. A. powder time fuze.
Propellant: Cylindrical lengths of smokeless powder, 95.9 grams.
Color and markings: Maroon with 12-mm green band around ogive.

Remarks: This round was evidently designed only for antiaircraft work, having no impact or tracer element. It is used in the Navy's Vickers-Armstrong guns, which are belt-fed with automatic fuze cutters attached.

Figure 370—40 mm High-Explosive Antiaircraft Projectile.

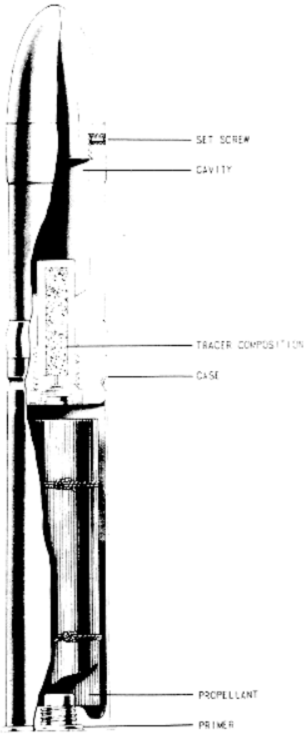


Figure 371—40-mm Tracer Projectile.

40-mm Tracer Projectile

Weight of complete round (with nose cap): 1.28 kg.
Weight of projectile (with tracer and nose cap): 0.90 kg.
Weight of tracer with charge: 0.07 kg.
Filling: None.
Diameter at bourrelet: 1.57 inches.
Length of projectile (with nose cap): 6.61 inches.
Length of assembled round (with nose cap): 11.30 inches.
Length of propellant case: 6.18 inches.
Width of rotating band: 0.63 inch.
Diameter of base of propellant case: 1.89 inches.
Fuzing: None.
Propellant: Cylindrical lengths of smokeless powder, 95.9 grams.
Color and marking: Orange over all.

Remarks: This round is similar in shape to the A. A. type. The nose, of solid construction with two large wrench flats, screws into the projectile body just before of the bourrelet with right-hand threads. The inside is lacquered. The tracer element is screwed into the base with left-hand threads.

It is used in the Vickers-Armstrong guns.

5-cm (47-mm) Complete Round and Common Projectile

Assembled round:
  Weight of complete round: 3.2 pounds.
  Length of complete round: 9.25 inches.
Projectile:
  Weight of filled projectile (with fuze): 2.4 pounds.
  Weight of projectile (empty): 2.1 pounds.
Dimensions:
  Length of projectile (without fuze): 5.31 inches.
  Diameter at bourrelet: 1.84 inches (46.7-mm).
  Distance from base to rotating band: 1.25 inches.
  Width of rotating band: 1.69 inches.
Filling: Loose granular black powder: 1.8 ounces (50 grams).
Fuzing: Hotchkiss patent fuze, screwed (R. H.) into base; a simple setback arming base fuze presumably of British manufacture. The base of the fuze is stamped "Hotchkiss Patent DOC." Weight of fuze, 2 ounces.
Case:
  Length: 5.19 inches.
  Diameter at base: 2.38 inches.
  Material: Brass (recovered); steel (documentary).
  Weight (empty): No data.
  The case is crimped into a groove in the base of the projectile by several short crimps.
Propellant: 5 C2 (type 2-year propellant) 2.4 ounces (0.067 kg.).

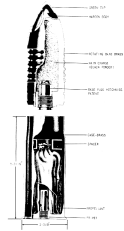


Figure 372—5-cm Complete Round and Common Projectile.

Unperforated Cylindrical sticks, approximately 0.5 mm ($\frac{1}{64}$—$\frac{1}{32}$ inch) by $3\frac{5}{16}$ inches amber-colored double-base powder.

The propellant sticks are enclosed in a compartmented bag of heavy brownish silk.

Primer: Small flush type (designation unknown).

Weapon in which used: Short 5-cm gun.

This gun, mounted on wooden-spoked wheels as a field piece, corresponds to old U. S. "landing guns" and is probably a copy of an obsolete British gun. The breech block is the vertical sliding type.

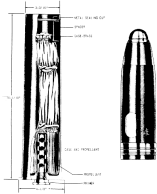


Figure 373—8-cm Complete Round (Semifixed).

8-cm (76.2-mm) (3-Inch) Complete Round (Semifixed)

Case:
- Length: 15.06 inches.
- Diameter at base: 4.13 inches.
- Material: Brass (recovered); steel (documentary).
- Weight (empty): 4.97 pounds.

Propellant:
- 20 3C (type 89 propellant) 1.98 pounds (0.900 kg.).

Unperforated cylindrical sticks, approximately 2-mm (1/16—3/32 inch) by 12.75 inches, amber-colored double-base powder.

The propellant sticks are enclosed in a bag of heavy brownish silk.

Primer: Mk I case percussion primer, Model 4.

Weapon in which used: "AN" (Armstrong) type 8-cm/40 gun (low angle).

Except for minor changes, this is an exact copy of a British naval gun, and guns of both British and Japanese manufacture have been found ashore in Japanese emplacements for coastal defense.

The gun is pedestal-mounted. The breech is closed by a two-step interrupted-thread block.

8-cm (76.2-mm) (3-Inch) (Ordinary Mk 2 Mod 2) High-Explosive Projectile

Weight of filled projectile (without fuze): 11.46 pounds.
Weight of projectile (empty): 10.75 pounds.
Weight stamped on rotating band (sample): 4.860 kg. (varies with individual projectiles).
Length of projectile (without fuze): 9.49 inches.
Diameter at bourrelet: 3.0 inches.
Distance from base to rotating band: 0.44 inch.
Width of rotating band: 1.0 inch.
Radius of ogive: 6 cal.
Filling: Cast picric acid (shimose): .71 pound.

The charge consists of a single block of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 5-year point detonating fuze.
Weapon in which used: "AN" (Armstrong) type 8-cm/40 gun (low angle).

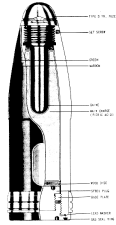


Figure 374—8-cm (Ordinary Mk 2 Mod 2) High-Explosive.

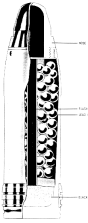


Figure 375—8-cm Shrapnel.

8-cm (76.2-mm) (3-Inch) Shrapnel Projectile

Assembled round:

Weight of complete round (without fuze): 19 pounds.

Length of complete round (without fuze): 23.75 inches.

Projectile:

Weight of filled projectile (without fuze): 16.8 pounds.

Weight of projectile (empty): No data

Weight stamped on rotating band (sample): 2.86 kg. (Varies with individual projectiles)

Dimensions:

Length of projectile (without fuze): 8.38 inches.

Diameter at bourrelet: 2.97 inches (75.5-mm).

Distance from base to rotating band: 0.75 inch.

Width of rotating band: 1.0 inch.

Radius of ogive: 4 cal.

Filling: Black powder and shrapnel balls.

Fuzing: 30-second time fuze.

Weapons in which used:

Type 3-year 8-cm/40 dual-purpose gun.
Type 88 8-cm/40 dual-purpose gun.
Type 98 8-cm/60 dual-purpose gun

8-cm (76.2-mm) (3-Inch) Complete Round (Fixed)

Case:

Length: 16.06 inches.

Diameter of base: 4.13 inches.

Material: Brass.

Weight (empty): 6.25 pounds.

The case is crimped tightly into a groove in the base of the projectile by a single continuous crimp.

Propellant:

20 C3 (type 89 propellant): 2.039 pounds (0.927 kg.).

Unperforated cylindrical sticks, approximately 2 mm (0.078 inch) by 12¾ inches, amber-colored double-base powder.

The propellant sticks are enclosed in a bag of heavy brownish silk. Primer Mk 2 case percussion primer, Model 4.

Weapons in which used: Type 88 8-cm/40 dual-purpose gun; 8-cm/40 type 3-year dual-purpose gun.

The latter gun is a pedestal-mounted gun with a breech block sliding diagonally down to the right. Although designed as a shipboard mount, it is commonly found mounted in fixed emplacements ashore for antiaircraft and coastal defense.

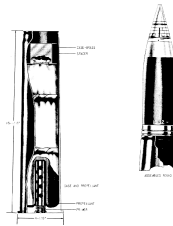


Figure 376—8-cm Complete Round (Fixed).

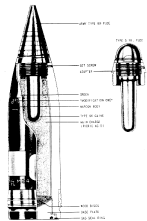


Figure 377—8-cm (Ordinary Mk 3 Mod 1) High-Explosive.

8-cm (76.2-mm) (3-Inch) (Ordinary Mk 3 Mod 1) High-Explosive

Assembled Round:

Weight of complete round: 19.25 pounds.

Length of complete round, with type 89 fuze: 28.25 inches.

Projectile:

Weight of filled projectile (without fuze): 9.5 pounds.

Weight, empty: 8.6 pounds.

Weight stamped on rotating band (sample): 4.865 kg. (varies with individual projectiles).

Dimensions:

Length of projectile (without fuze or adapter): 9.25 inches.

Diameter at bourrelet: 2.97 inches (75.5-mm).

Distance from base to rotating band: 0.75 inch.

Width of rotating band: 1.0 inch.

Radius of ogive: 4 cal.

Filling: Cast picric acid (shimose): 0.9 pound.

The charge consists of a single block of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing:

a. Army type 89 powder time fuze (30 seconds).

b. Type 5 yr. point detonating fuze (instantaneous) with adapter.

Weapon in which used:

Type 3-year, 8-cm/40 dual purpose gun.
Type 88 8-cm/40 dual purpose gun.

8-cm (76.2-mm) (3-Inch) (Armor-Piercing Type 1) Special Common

Assembled round:

Weight of complete round: 21.04 pounds.
Length of complete round: 25.31 inches.

Projectile:

Weight of filled projectile (with fuze): 12.70 pounds.
Weight, empty: 11.72 pounds.
Weight Stamped on Rotating Band (sample): 5.31 kg. (varies with individual projectiles).

Dimensions:

Length of projectile: 9.875 inches.
Diameter at bourrelet: 2.98 inches (76.0 mm).
Distance from base to rotating band: 0.75 inch.
Width of rotating band: 1.0 inch.
Radius of ogive: 4 cal.

Filling: Trinitroanisole (type 91 explosive): 0.41 pound.

The charge consists of a single block of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 1 fuze.

Weapon in which used:

Type 3-year 8-cm/40 dual-purpose gun.
Type 88 8-cm/40 dual-purpose gun.

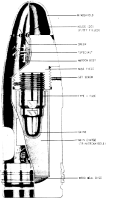


Figure 378—8-cm (Armor-Piercing Type 1) Special Common.

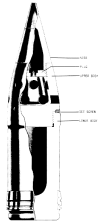


Figure 379—8-cm Time Practice.

8-cm (76.2-mm) (3-Inch) Time Practice Projectile

Assembled round:
- Weight of complete round: No data.
- Length of complete round: 28.06 inches.

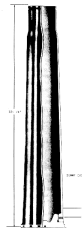
Projectile:
- Weight of filled projectile: No data.
- Weight of projectile, empty: 12.30 pounds.
- Weight stamped on rotating band (sample): 5.200 kg. (varies with individual projectiles).

Dimensions:
- Length of projectile: 12.69 inches.
- Diameter at bourrelet: 2.98 inches (76.0 mm).
- Distance from base to rotating band: .69 inch.
- Width of rotating band: 1.0 inch.
- Radius of ogive: 4 cal.

Filling: No data. Possibly smoke compound or spotting dye.

Fuzing: Type 98 time fuze.

Weapon in which used:
- Type 98 8-cm/60 dual-purpose gun.
- 8-cm short dual-purpose gun.



10-cm (100-mm) (3.9-inch) Complete Round (Fixed)

Case:

Length: 32.25 inches.
Diameter of base: 6.81 inches.
Material: Brass.
Weight (empty): No data.

The case is crimped tightly into a groove in the base of the projectile by a single continuous crimp.

Propellant: 20 DL2 (type 93 Mk 2 propellant): 12.7 pounds (5.740 kg.).

Documentary evidence and relationship to other known propellants indicates that this propellant is a double base powder in the form of flat strips.

Primer: Mk 2 case percussion primer, Model 4.

Weapon in which used:

Type 98 10-cm/50 dual-purpose gun.
Type 98 10-cm/65 dual-purpose gun, twin.

Figure 380—10-cm Complete Round (Fixed).

The latter is a modern gun, paired in a twin power-driven mount designed especially for antiaircraft aboard ships. It has been found ashore, unaltered in the characteristic gun-house mount used aboard ship.

Special features of this gun and mount are horizontally opposed sliding breech blocks, full power drive, and automatic fuze setting accomplished as the loading tray moves the round into position to be rammed. The arrangement for loading and fuze setting, and the general plan of the mount corresponds closely to that of the type 89 12.7-cm/40 twin mount.

10-cm (100-mm) (3.9-Inch) High-Explosive Projectile

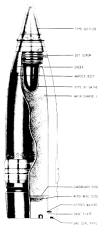


Figure 381—10-cm High-Explosive.

Assembled round:

Weight of complete round: 62.75 pounds.

Length of complete round, with type 98 fuze: 46.0 inches.

Projectile:

Weight of filled projectile (without fuze): 28.19 pounds.

Weight of projectile, empty: 25.06 pounds.

Weight stamped on rotating band (sample): 10.880 kg. (varies with individual projectiles).

Length of projectile (without fuze): 12.63 inches.

Diameter at bourrelet: 3.94 inches (99 mm).

Distance from base to rotating band: 2.69 inches.

Width of rotating band: 1.75 inches.

Radius of ogive: No data.

Filling:

TNT (type 92 explosive): 3.13 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing:

Type 98 mechanical time fuze (45 seconds).

Type 88 point detonating fuzes.

Weapon in which used:

Type 98 10 cm/65 dual-purpose gun.

Type 98 10 cm/50 dual-purpose gun.

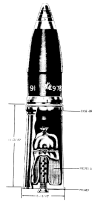


Figure 382—12-cm Short Complete Round (Fixed).

12-cm/Short (120-mm) (4.7-Inch) Complete Round (Fixed)

Case:

Length: 11.19 inches.

Diameter of base: 5.81 inches.

Material: Brass or steel.

Weight (empty): No data.

The case is crimped tightly into a groove in the base of the projectile by a single continuous crimp.

Propellant:

9 C3 (type 89 propellant): 1.1 pound (0.5 kg.).

Unperforated cylindrical sticks, approximately 0.9 mm (1/32 inch) by 6–7 inches, amber-colored double-base powder.

The propellant sticks are enclosed in a compartmented bag of heavy brownish silk.

Primer: Mk 1 case percussion primer, Model 4.

Weapon in which used: Short 12 cm gun.

This is a short-barreled (12 caliber) gun of low muzzle velocity and light construction on a pedestal mount designed originally for use on the light decks of merchant ships. The purpose of this weapon is to deliver a relatively heavy projectile at a limited range for anti-submarine attack and to throw up low level anti-aircraft barrage.

This gun fires fixed ammunition; the breech block is of the interrupted thread type. This gun is the lighter-caliber counterpart of the short 20-cm gun, which has been found mounted ashore.

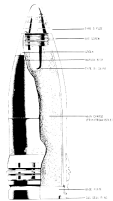


Figure 383—12-cm Short High-Explosive.

12-cm/Short (120-mm) (4.7-Inch) High-Explosive

Assembled round:
- Weight of complete round: No data.
- Length of complete round (with type 0 fuze): 24.8 inches.

Projectile:
- Weight of filled projectile (without fuze): 26.0 pounds.
- Weight of projectile, empty: 20.5 pounds.
- Weight stamped on rotating band (sample): 9.340 kg. (varies with individual projectiles).

Dimensions:
- Length of projectile (without fuze): 12.6 inches.
- Diameter at bourrelet: 4.7 inches (119.5 mm.)
- Distance from base to rotating band: 1.5 inches.
- Width of rotating band: 1.0 inches.
- Radius of ogive: No data.

Filling:
- Trinitroanisole (type 91 explosive): 5.5 pounds.

  The charge consists of a single block of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing:
- Type 0 mechanical time fuze (red-nosed) for A. A. use.
- Type 88 Model 4 point detonating fuze.

Weapon in which used: Short 12 cm gun.

Remarks: The extremely thin wall of this projectile is possible only by virtue of the low muzzle velocity of the howitzer-like weapon. The high charge/weight ratio is intended for effectiveness in use as an under-water charge against submarines, though the projectile may also be time-fuzed for antiaircraft use.

12-cm (120-mm) (4.7-Inch) Complete Round (Semifixed)

Case:
  Length: 21.63 inches.
  Diameter of base: 6.38 inches.
  Material: Brass.
  Weight (empty): 11.13 pounds.

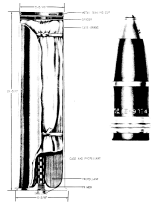


Figure 384—12-cm Complete Round (Semifixed).

Propellant: 30 DC (type 13 propellant): 11.88 pounds (5.40 kg.).

Unperforated cylindrical sticks, approximately 3.0 mm (⅛ inch) by 19.4 inches (long sticks) or 6.4 inches (short sticks), amber-colored double-base powder.

The propellant sticks are enclosed in a bag of heavy brownish silk.

Primer: Mk 1 case percussion primer, Model 4.

Weapons in which used:

Type 3-year 12-cm/45 gun (low angle).

This is a pedestal-mounted deck gun characterized by having three recoil cylinders, all mounted below the tube. An interrupted thread breech block is hinged to swing horizontally to the right. This gun has been found both with and without an attached splinter shield.

British type 12-cm/40 gun (low angle).

This gun is characterized by having no recoil cylinders above the tube. An interrupted thread breech block is hinged to swing horizontally to the right. Guns of original British manufacture as well as Japanese-made copies have been found in Japanese island defenses.

The following gun is known to use semi-fixed ammunition strongly resembling that for the two guns listed above, but exact size and description of propellant case is not available.

Type 11-year 12-cm/45 gun (low angle).

This gun is unique in having two recoil cylinders above the tube and one below. The breech block is the horizontal sliding type.

12-cm (120-mm) (4.7-Inch) High-Explosive (Ordinary Mk 3)

Weight of filled projectile (without fuze): 44.75 pounds.

Weight of projectile, empty: 41.14 pounds.

Weight stamped on rotating band (sample): 18.520 kg. (varies with individual projectiles)

Length of projectile (without fuze): 15.95 inches.

Diameter at bourrelet: 4.6 inches (119.0 mm).

Distance from base to rotating band: 0.78 inch.

Width of rotating band: 1.95 inches.

Radius of ogive: 4 cal.

Filling: Cast picric acid (shimose): 3.61 pounds.

The charge consists of two blocks of explosive cast and sealed in a waxed paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 5-year point detonating fuze.

Weapon in which used:

British type 12-cm/40 gun (low angle).
Type 3-year 12-cm/45 gun (low angle).
Type 11-year 12-cm/45 gun (low angle).

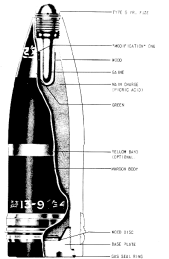


Figure 385—12-cm (Ordinary Mk 3) High-Explosive.

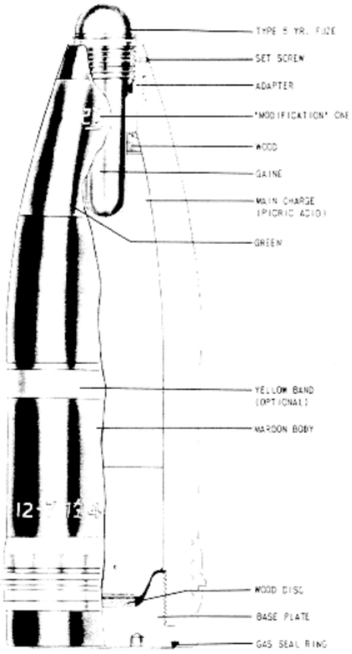


Figure 386—12-cm High-Explosive (Ordinary Mk 3 Mod 1).

12-cm (120-mm) (4.7-Inch) High-Explosive (Ordinary Mk 3 Mod 1)

Weight of filled projectile (without fuze): 44.75 pounds.
Weight of projectile, empty: 41.14 pounds.
Weight stamped on rotating band (sample): 18.520 kg. (varies with individual projectiles).
Length of projectile (without fuze or adapter): 14.1 inches.
Diameter at bourrelet: 4.7 inches (119.5 mm).
Distance from base to rotating band: 0.78 inch.
Width of rotating band: 1.95 inches.
Radius of ogive: 4 cal.
Filling: Cast picric acid (shimose) 3.61 pounds.

The charge consists of two blocks of explosive cast and sealed in a waxed paper container, encased in a heavy cotton flannel bag and sealed in the projectile with paraffin.

Fuzing:
- a. With adapter: Type 5-year point detonating fuze.
- b. Without adapter: Type 88 point detonating fuze.

This projectile cannot be fuzed with standard mechanical time fuzes for A. A. use because it will not accommodate the auxiliary gaine used with these fuzes.

Weapons in which used:
British type 12-cm/40 gun (low angle).
Type 3-year 12-cm/45 gun (low angle).
Type 11-year 12-cm/45 gun (low angle).

12-cm (120-mm) (4.7-Inch) High-Explosive (Ordinary Mk 4)

Weight of projectile filled (without fuze): No data.
Weight of projectile, empty: 39.06 pounds.
Weight stamped on rotating band (sample): 17.62 kg. (varies with individual projectile).

Length of projectile (without fuze): 13.94 inches.
Diameter at bourrelet: 4.7 inches (119.5 mm).
Distance from base to rotating band: 1.19 inches.
Width of rotating band: 1.25 inches.
Radius of ogive: No data.
Filling: Picric acid (shimose): No data.

Fuzing:
    Type 91 mechanical time fuze.
    Type 88 point detonating fuzes.
Weapon in which used:
    British type 12-cm. gun (low angle).
    Type 3-year. 12-cm/45 gun (low angle).

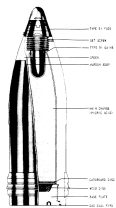


Figure 387—12-cm (Ordinary Mk 4) High-Explosive.

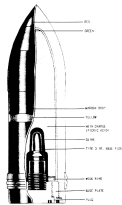


Figure 388—12-cm Common.

12-cm (120-mm) (4.7-Inch) Common Projectile

Weight of filled projectile (with fuze): 45.12 pounds.
Weight of empty projectile: 40.56 pounds.
Length of projectile: 16.39 inches.
Diameter at bourrelet: 4.7 inches (119.5 mm).
Distance from base to rotating band: 1.19 inches.
Width of rotating band: 1.25 inches.
Radius of ogive: No data.
Filling: Picric acid (shimose): No data.
Fuzing: Type 3-year Mk 1 base fuze.
Weapons in which used:
  British type 12-cm. gun (low angle).
  Type 3-year 12-cm/45 gun (low angle).
  Type 11-year. 12-cm/45 gun (low angle).

12-cm (120-mm) (4.7-Inch) Illuminating Projectile

Weight of filled projectile: 44 pounds.
Weight of empty projectile: No data.
Weight stamped on rotating band: No data.
Length of projectile (without fuze): $13\frac{13}{16}$ inches.
Diameter at bourrelet: $4\frac{11}{16}$ inches (119 mm).
Distance from base to rotating band: No data.
Width of rotating band: $1\frac{15}{16}$ inches.
Radius of ogive: No data.

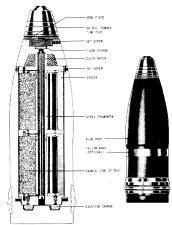


Figure 389—12-cm Illuminating.

Filling: Expelling charge (black powder): 0.5 ounce.

Illuminant: These are 10 pyrotechnic cylinders arranged in two layers of 5 cylinders each. A cylinder is formed of a tough waxed cardboard tube containing a silver pyrotechnic mixture in the center and a reddish-brown pyrotechnic mixture in either end.

Weight (each cylinder): 5.4 ounce.

Analysis of illuminant:

Barium nitrate: 35.6 percent.
Potassium nitrate: 10.4 percent.
Magnesium: 38.0 percent.
Wax: 13.9 percent.
Carbon: 0.8 percent.
Sulphur: 1.3 percent.

Analysis of first fire compound:

Potassium nitrate: 63.2 percent.
Iron oxide: 3.8 percent.
Aluminum oxide: 1.1 percent.
Sulphur: 8.2 percent.
Wax: 5.5 percent.
Glass: 6.1 percent.
Carbon: 12.1 percent.

Cylinder metal frame:

This frame fills the cavity of the projectile and is positioned by studs. There are three metal discs attached to a central spindle which provides a method of functioning and serves to support the pyrotechnic increments. Arranged about the circumference of this frame are two layers of five steel wedges which position the pyrotechnic increments within the frame.

Fuzing: 30-second time fuze.

Weapons in which used:

Type 11-year. 12-cm/45 gun.
Type 3-year. 12-cm/45 gun.

Operation: When the fuze functions, the flash from the black powder magazine ignites a small black powder charge in the nose of the projectile, which in turn ignites the powder trains in the central spindle. The flash from this train ignites the powder trains in the three discs and thus the ten increments and the ejecting charge. As the cylinder is blown from the case, it shears the studs and forces the nose and body of the projectile apart.

Figure 390—12-cm Target.

12-cm (120-mm) (4.7-Inch) Target Projectile

Weight of filled projectile (without fuze): 43.27 pounds.
Weight of empty projectile: No data.
Weight stamped on rotating band (sample): 19.02 kg (varies with individual projectiles).
Length of projectile (without fuze): 15.56 inches.
Diameter at bourrelet: 4.70 inches (119.5 mm).
Distance from base to rotating band: 1.56 inches.
Width of rotating band: 2.00 inches.
Radius of ogive: 4 cal.
Filling: No data.
Fuzing: 30-second time fuze.
Weapon in which used:
  Type 11-year. 12-cm/45 gun.
  Type 3-year. 12-cm/45 gun.

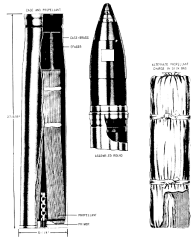


Figure 391—12-cm Complete Round (Fixed).

12-cm (120-mm) (4.7-Inch) Complete Round (Fixed)

Case:

- Length: 27.63 inches.
- Diameter of base: 6.25 inches.
- Material: Brass.
- Weight (empty): 18.59 pounds.

The case is crimped tightly into a groove in the base of the projectile by a single continuous crimp.

Propellant, 30 DC (type 13 propellant): 12.0 pound (5.50 kg).

Unperforated cylindrical sticks, approximately 3.0 mm ($\frac{3}{32}$-inch–$\frac{1}{8}$-inch) by 19.8 inches, graphited double-base powder.

In the H. E. rounds recovered, the propellant sticks are enclosed in a bag of heavy brownish silk.

In the incendiary shrapnel round the sticks of propellant were tied together and placed in the case without being enclosed in the customary coarse silk bag. The latter arrangement may be a new trend not necessarily limited to the round in which it was first found.

Primer: Mk 2 case percussion primer, Model 4.

Weapon in which used: Type 10th year 12-cm/45 dual-purpose gun.

This weapon is a pedestal-mounted gun designed for antiaircraft use aboard ship which has been found ashore either with or without a distinctive gun-house type of shield. The gun is manually controlled. The breech-block is the horizontal type, sliding to the right. This has been one of the most common and most effective Japanese land-based A. A. guns.

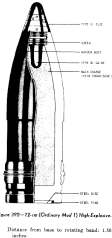


Figure 392—12-cm (Ordinary Mod 1) High-Explosive.

12-cm (120-mm) (4.7-Inch) High-Explosive (Ordinary Mod 1)

Assembled round:
- Weight of complete round: 74.03 pounds.
- Length of complete round (with type 91 fuze): 41.75 inches (approximately).

Projectile:
- Weight of filled projectile (without fuze) 43.34 pounds.
- Weight of empty projectile: 39.38 pounds.
- Weight stamped on rotating band (sample): 17.9 kg. (varies with individual projectiles).

Dimensions:
- Length of projectile (without fuze): 13.95 inches.
- Diameter at bourrelet: 4.6 inches (119.0 mm.).
- Distance from base to rotating band: 1.56 inches.
- Width of rotating band: 1.9 inches.
- Radius of ogive: 4 cal.

Filling:
- Trinitroanisole (type 91 explosive): 3.96 pounds.
- The explosive is cast directly in the projectile body.

Fuzing:
- Type 91 mechanical time fuze.
- Type 88 point detonating fuzes.

Weapon in which used:
- Type 10-year 12-cm/45 dual-purpose gun.

Remarks: The base of the projectile is slightly recessed to receive a steel plate which is locked in by a steel ring. This arrangement is presumed to be a seal to prevent the propellant gases entering possible flaws in the solid base of the projectile. A similar feature is common in U. S. Army projectiles.

12-cm (120-mm) (4.7-Inch) High-Explosive (Ordinary Mod 2)

Assembled round:
  Weight of complete round: 72.53 pounds.

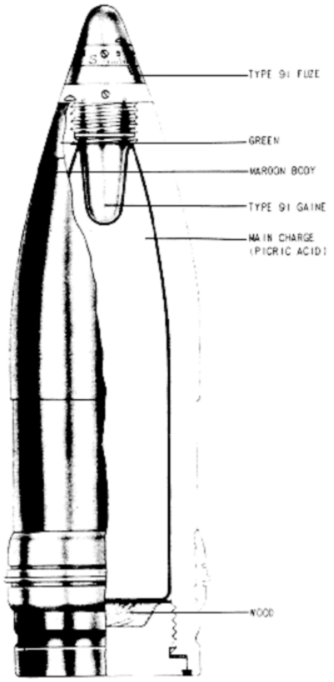


Figure 393—12-cm (Ordinary Mod 2) High-Explosive.

  Length of complete round (with type 91 fuze): 41.75 inches (approximately).
Projectile:
  Weight of filled projectile (without fuze): 41.84 pounds.
  Weight of empty projectile: 38.41 pounds.
  Weight stamped on rotating band (sample): 17.46 kg. (varies with individual projectiles).
Dimensions:
  Length of projectile (without fuze): 13.95 inches.
  Diameter at bourrelet: 4.6 inches (119 mm).
  Distance from base to rotating band: 1.56 inches.
  Width of rotating band: 1.9 inches.
  Radius of ogive: 4 cal.
Filling: Cast picric acid (shimose): 3.43 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing:
  Type 91 mechanical time fuze.
  Type 88 point detonating fuzes.
Weapon in which used: Type 10th year 12-cm/45 dual-purpose gun.

12-cm (120-mm) (4.7-Inch) Incendiary Shrapnel

Assembled round:
  Weight of complete round: 75.66 pounds.
  Length of complete round (with type 91 fuze): 41.15 inches (approximate).
Projectile:
  Weight of filled projectile (without fuze): 44.97 pounds.

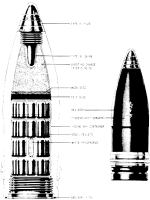


Figure 394—12-cm Incendiary Shrapnel.

Weight of empty projectile: 33.13 pounds.
Weight stamped on rotating band (sample): 15.06 kg. (varies with individual projectiles).

Dimensions:
Length of projectile (without fuze): 13.95 inches.
Diameter at bourrelet: 4.6 inches (119.0 mm).
Distance from base to rotating band: 1.56 inches.
Width of rotating band: 1.9 inches.
Radius of ogive: 4 cal.

Filling:
Cast picric acid (shimose): 1.19 pounds.
Incendiary charge (W. P. and 48 steel pellets): 8.55 pounds.

The explosive charge consists of a block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the nose of the projectile with paraffin.

Fuzing:
Type 91 mechanical time fuze.
Type 88 point detonating fuzes.

Weapon in which used: Type 10 year 12 cm/45 dual-purpose gun.

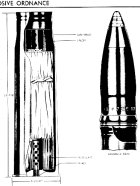


Figure 395—12.7-cm Complete Round (Fixed).

12.7-cm (127-mm) (5-Inch) Complete Round (Fixed)

Case:

Length: 22.88 inches.

Diameter of base: 6.66 inches.

Material: Brass.

Weight (empty): 16 28 pounds.

The case is crimped tightly into a groove in the base of the projectile by a single continuous crimp.

Propellant:

21 DC (type 13 propellant): 8.87 pounds (4.03 kg.).

Unperforated cylindrical sticks, approximately 2.1 mm (.079 in.) by 15.75 in., graphited double-base powder.

The propellant sticks are enclosed in a compartmented bag of heavy brownish silk.

Primer: Mk 2 case percussion primer Model 4.

Weapons in which used:

Type 88 12.7-cm/40 dual-purpose gun.

Type 89 12.7-cm/40 dual-purpose gun (twin).

This latter is a modern gun, paired in a twin power-driven mount designed especially for antiaircraft aboard ships. It has been found ashore, unaltered, in the characteristic gun-house mount used aboard ship.

Special features of this gun and mount are horizontal opposed sliding breech blocks, full power drive, and automatic fuze-setting accomplished as the loading tray moves the round into position to be rammed. The arrangement for loading and fuze-setting and the general plan of the mount corresponds closely to that of the Type 98 10-cm/65 twin mount.

12.7-cm (127-mm) (5-Inch) High-Explosive

Assembled round:
- Weight of complete round: 73.57 pounds.
- Length of complete round (with type 91 fuze): 36.0 inches (approximately).

Projectile:
- Weight of filled projectile (without fuze): 48.42 pounds.
- Weight of empty projectile: 44.48 pounds.
- Weight stamped on rotating band (sample): 20.170 kg. (varies with individual projectiles).

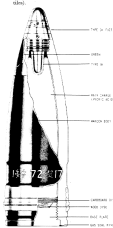


Figure 396—12.7-cm High-Explosive.

Dimensions:
- Length of projectile (without fuze): 14.9 inches.
- Diameter at bourrelet: 4.96 inches (126.0 mm).
- Distance from base to rotating band: 1.19 inches.
- Width of rotating band: 1.95 inches.
- Radius of ogive: 6 cal.

Filling:
- Cast picric acid (shimose): 3.94 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing:
- Type 91 mechanical time fuze.
- Type 88 point detonating fuze.

Weapon in which used:
- Type 89 12.7-cm/40 dual-purpose gun.
- Type 88 12.7-cm/40 dual-purpose gun.

(Type 3 Ordinary) 12.7-cm (127-mm) (5-Inch) Incendiary Shrapnel

Assembled round:
- Weight of complete round: 78.36 pounds.
- Length of complete round (without fuze): 36.43 inches.

Projectile:
- Weight of filled projectile (without fuze): 53.21 pounds.
- Weight of empty projectile: No data.
- Weight stamped on rotating band (sample): 17.17 kg. (varies with individual projectile).

Dimensions:
- Length of projectile (without fuze): 14.8 inches.
- Diameter at bourrelet: 4.97 inches (126.3 mm).
- Distance from base to rotating band: 1.25 inches.
- Width of rotating band: 2.0 inches.
- Radius of ogive: 6 cal.

Filling:
- Cast picric acid (shimose): 162 grams.
- Tetryl: 2.3 grams.
- Lead Azide: 0.13 grams.

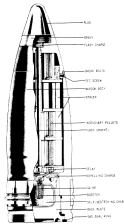


Figure 397—12.7-cm Incendiary Shrapnel (Ordinary Type 3).

Black powder: 35 grams.
Incendiary charge (43 steel pellets 50 mm in length and 20 mm in diameter filled with a dry incendiary mix of the following composition:
Magnesium: 54 percent.
Barium dioxide: 26 percent.
Rubber: 15 percent.
Iron oxide: 1.5 percent.
Sulphur: 3 percent.
Fuzing: Type 91 mechanical time fuze.
Weapon in which used: Type 89 12.7-cm/40 high-angle gun.

Remarks: The black powder charge in the nose ignites the incendiary pellets and flashes down the central tube igniting relay disks and the expelling charge.

The expelling charge ejects the incendiary pellets and ignites a primer in the base section which detonates the gaine and bursting charge.

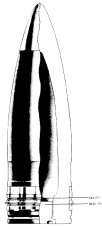


Figure 398—12.7-cm Practice.

12.7-cm (127-mm) (5-Inch) Practice

Assembled round:

- Weight of complete round: 75.84 pounds.
- Length of complete round: 40.20 inches.

Projectile:

- Weight of filled projectile: 50.69 pounds.
- Weight of empty projectile: 48.10 pounds.
- Weight stamped on rotating band (sample): 21.80 kg. (varies with individual projectile).

Dimensions:

- Length of projectile: 17.32 inches.
- Diameter at bourrelet: 4.97 inches (126.3 mm).
- Distance from base to rotating band: 1.61 inches.
- Width of rotating band: 1.95 inches.
- Radius of ogive: 6 cal.

Filling: Sand.

Fuzing: None.

Weapon in which used: Type 89 12.7-cm/40 dual-purpose gun.

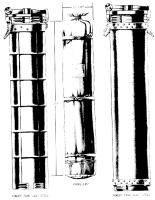


Figure 399—14-cm Propellant and Tanks.

14-cm (140-mm) (5.5-Inch) Propellant and Tanks

Powder tanks:

For storage purposes, the propellant charges are sealed in waterproof containers commonly known as "powder tanks." Two types of the tanks have been recovered: one is a heavy tank (26.4 pounds) of cast steel and bronze; the other is sheet steel and aluminum and weighs 15.4 pounds. Both are well lacquered inside and have the same internal dimensions, 6.2 inches by 33.4 inches.

Propellant: 37 C: 24.51 pounds (11.14 kg.).

Unperforated cylindrical sticks approximately 3.7 mm (0.15 inch) by 28 inches graphited double-base powder.

The propellant sticks are enclosed in a bag of heavy brownish silk.

An ignition pad containing 17.2 grams of granular black powder is laced onto the base of the charge.

Primer: Mk 2 lock percussion primer.

Weapon in which used: Type 3d year 14-cm/50 gun (low angle).

This is a pedestal-mounted deck gun employing bag ammunition. It is commonly found in shore emplacements for coastal defense and limited antiaircraft use. Strongly resembling the type 3d year 12-cm/45 gun in design, this weapon also has three recoil cylinders all mounted above the tube and an interrupted thread breech block hinged on the right. This gun has been found both with a splinter shield attached, and without.

14-cm (140-mm) (5.5-Inch) High-Explosive Projectile

Weight of filled projectile (without fuze): 82.7 pounds.

Weight of empty projectile: 74.43 pounds.

Weight stamped on rotating band (sample): No data (varies with individual projectile).

Length of projectile (without fuze, with adapter): 21.02 inches.

Length of projectile (without fuze or adapter): 19.75 inches.

Diameter at bourrelet: 5.49 inches (139.5 mm).

Distance from base to rotating band: 0.60 inch.

Width of rotating band: 1.60 inches.

Radius of ogive: 5 cal.

Filling: Cast picric acid (shimose): 7.9 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 5th year point detonating fuze.

Removal of the adapter does not permit alternate fuzing, because the lower threaded portion of the adapter is larger than any known fuze.

Weapon in which used: Type 3d year 14-cm/50 gun (low angle).

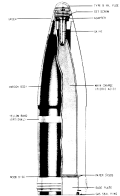


Figure 400—14-cm High-Explosive.

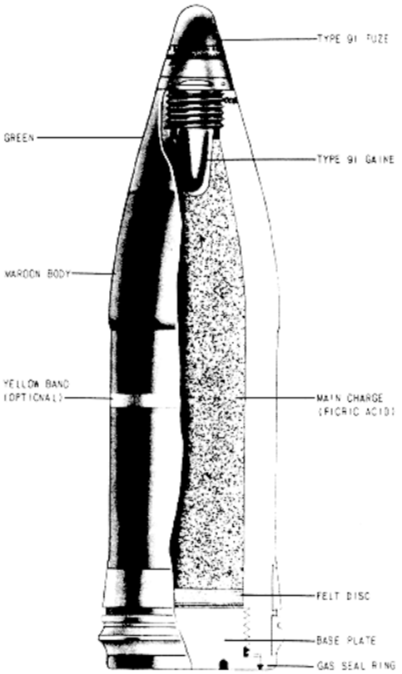


Figure 401—14-cm (Ordinary Type 0) High-Explosive.

(Type 0 Ordinary) 14-cm (140-mm) (5.5-Inch) High-Explosive Projectile

Weight of filled projectile (without fuze): 88.22 pounds.
Weight of empty projectile: 81.62 pounds.
Weight stamped on rotating band (sample): 34.100 kg. (varies with individual projectiles).
Length of projectile (without fuze): 21.55 inches.
Diameter at bourrelet: 5.49 inches (139.5 mm).
Distance from base to rotating band: 0.59 inch.

Width of rotating band:

Forward: 1.11 inches.
Space: 0.38 inch.
Aft: 1.09 inches.

Radius of ogive: No data.
Filling: Cast picric acid (shimose): 6.60 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing:

Type 91 mechanical time fuze.
Type 88 point detonating fuze.

Weapon in which used: Type 3d year. 14-cm/50 gun (low angle).

Remarks: This projectile permits the 14 cm/50 gun to be used for antiaircraft fire, but the angle of elevation of the weapon definitely limits its effectiveness.

(Ordinary Mk 1) 14-cm (140-mm) (5.5-Inch) Common Projectile

Weight of filled projectile (with fuze): 83.82 pounds.

Weight of empty projectile: 77.88 pounds.

Weight stamped on rotating band (sample): 34.300 kg. (varies with individual projectiles).

Length of projectile: 21.70 inches.

Diameter at bourrelet: 5.49 inches (139.5 mm).

Distance from base to rotating band: 0.59 inch.

Width of rotating band:

Forward: 1.11 inches.

Space: 0.38 inch.

Aft: 1.09 inches.

Radius of ogive: No data.

Filling: Cast picric acid (shimose): 5.94 pounds.

The charge consists of two blocks of explosive cast and sealed in waxed-paper containers encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 13th year Mk 1 Mod 1 base fuse.

Weapon in which used: Type 3d year. 14-cm/50 gun.

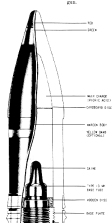


Figure 402—14-cm (Ordinary Mk 1) Common.

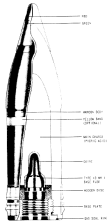


Figure 403—14-cm (Ordinary Mod 1) Common Capped.

(Ordinary Mod 1) 14-cm (140-mm) (5.5-Inch) Common Capped

Weight of filled projectile (with fuze): 84.94 pounds.
Weight of empty projectile: 80.14 pounds.
Weight stamped on rotating band (sample): 35.800 kg. (varies with individual projectiles).
Length of projectile: 21.63 inches.
Diameter at bourrelet: 5.49 inches (139.5 mm).
Distance from base to rotating band: 0.593 inch.
Width of rotating band:
  Forward: 1.11 inches.
  Space: 0.38 inches.
  Aft: 1.09 inches.
Radius of ogive: Not determined.
Filling: Cast picric acid (shimose): 4.80 pounds.

The charge consists of a single block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 13th year Mk 1 Mod 1 base detonating.
Weapon in which used: Type 3d year 14-cm/50 gun.

14-cm (140-mm) (5.5-Inch) Illuminating Projectile

Weight of filled projectile (without fuze): 87.5 pounds.

Weight of empty projectile: 67.46 pounds (approximate).

Weight stamped on rotating band (sample): No data (varies with individual projectiles).

Length of projectile (without fuze): 20.3 inches.

Diameter at bourrelet: 5.49 inches (139.5 mm).

Distance from base to rotating band: 0.59 inch.

Width of rotating band:

  Forward: 1.11 inches

  Space: 0.38 inch.

  Aft: 1.09 inches.

Radius of ogive: No data.

Filling:

  Primary ejection charge (black powder): 100 grams.

  Secondary ejection charge (black powder): 41 grams.

  Initiating pellet, relay train, and delay are black powder.

  The ignition compound for the illuminant is a mixture of potassium nitrate, iron oxide, aluminum, sulphur, and wax.

  The illuminant is a mixture of barium nitrate, magnesium, and wax.

  Weight: 31 pounds.

Fuzing: Type 91 mechanical time fuze.

Weapon in which used: Type 3d year 14-cm/50 gun.

Operation: At the end of the time set, the mechanical time fuze fires the initiating pellet. The relay train transmits the flash to the base of the primary ejection charge container and ignites the charge. The primary ejection charge expels the canister containing the illuminating charge and its parachute, and also ignites the delay element. A short time after the canister is ejected from the projectile body, the delay element fires the secondary ejection charge which expels the illuminating charge and parachutes and ignites the illuminant. Two parachutes, a large one above a small one, suspend the illuminating unit.

Burning time, not determined.

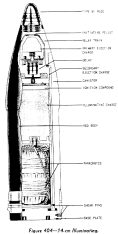


Figure 404—14-cm Illuminating.

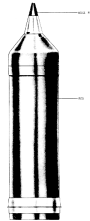


Figure 405—14-cm Smoke.

14-cm (140-mm) (5.5-Inch) Smoke Projectile

Weight of filled projectile (without fuze): 68.80 pounds.

Weight of empty projectile: No data.

Weight stamped on rotating band (sample): No data (varies with individual projectiles).

Length of projectile (without fuze): 20.63 inches.

Diameter at bourrelet: 5.49 inches (139.5 mm).

Distance from base to rotating band: 0.65 inch.

Width of rotating band: 1.56 inches.

Filling: Presumably white phosphorus.

Fuzing: Probably type 98 mechanical time fuze.

Weapon in which used: Type 3d year 14-cm/50 gun.

14-cm (140-mm) (5.5-Inch) Cartridge Case (Semifixed)

Case:

Length: 21.67 inches.
Diameter of base: 7.00 inches.
Material: Brass.
Weight (empty): 17.0 pounds.

Propellant:

30 DC (type 13 propellant): 6.860 kg.

Unperforated cylindrical sticks approximately 3 mm (⅛ inch) by 501 mm (19¾ inch) of graphited double-base powder.

The propellant sticks are enclosed in a bag of heavy brownish silk.

Primer: No data.

Weapon in which used: Not known.

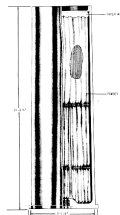


Figure 406—14-cm Cartridge Case (Semifixed).

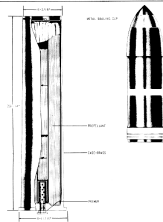


Figure 407—15-cm Complete Round (Semifixed).

15-cm (152-mm) (6-Inch) Complete Round (Semifixed)

Case:
  Length: 29.25 inches.
  Diameter of base: 6.69 inches.
  Material: Brass.
  Weight (empty): 27.0 pounds.
Propellant:
  37 DC 18.94 pounds (8.140 kg.).

Unperforated cylindrical sticks approximately ½ in. by 26 in. of graphited double-base powder

The propellant sticks are enclosed in a bag of heavy brownish silk.

Primer: Mk 1 case percussion primer Model 4.
Weapon in which used: Type 41 (Meiji) 15 cm/40 gun (low angle).

This, like many other Japanese Navy guns, is a copy of a British design, and guns manufactured by Armstrong-Whitworth have been found emplaced together with pieces of Japanese manufacture. It is a pedestal-mounted deck gun, commonly found with a partially enclosing splinter shield attached. The breech block is an interrupted thread plug, mounted to swing to the right.

14-cm (152-mm) (6-Inch) Common (Ordinary Mod 1)

Weight of filled projectile: No data.
Weight of empty projectile: No data.
Weight stamped on rotating band (sample): 39.62 kg. (varies with individual projectiles).
Length of projectile: 22.50 inches.
Diameter at bourrelet: 5.98 inches (152.0 mm).
Distance from base to rotating band: 0.66 inches
Width of rotating band: 1.75 inches.
Radius of ogive: 2 cal.
Filling:
Cast picric acid (shimose): No data.

The charge consists of a block of explosive cast and sealed in a waxed-paper container, encased in a heavy cotton-flannel bag and sealed in the projectile with paraffin.

Fuzing: Type 13th-year Mk 1 base fuze.
Weapon in which used: Type 41 (Meiji) 15-cm/40 gun or the British prototype.

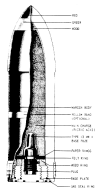


Figure 408—15-cm (Ordinary Mod 1) Common.

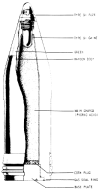


Figure 409—15-cm (Ordinary Type 0) High-Explosive.

(Ordinary Type 0) 15-cm (152-mm) (6-Inch) High-Explosive

Weight of filled projectile (without fuze): 97.59 pounds.
Weight of empty projectile: 90.82 pounds.
Weight, stamped on rotating band (sample): 41.28 kg. (varies with individual projectiles).
Length of projectile (without fuze): 20.0 inches.
Diameter at bourrelet: 6.0 inches (152 mm).
Distance from base to rotating band: 0.7 inch.
Width of rotating band:

- Forward: 1.2 inches.
- Space: No data.
- Aft: 1.2 inches.

Radius of ogive: 4 cal.
Filling: Cast picric acid (shimose): 6.8 pounds.

The charge is made into a waxed-paper-wrapped preformed block with a well in the nose to receive the gaine.

Fuzing: Type 88 nose fuzes.

Weapons in which used:

- 15 cm/40 gun (bag).
- 15 cm/45 gun (bag).
- 15 cm/50 gun (bag).

(Ordinary Mk 4) 15-cm (152-mm) (6-Inch) Common

Weight of filled projectile (without fuze): 97.8 pounds.
Weight of empty projectile: 91.9 pounds.
Weight stamped on rotating band: 41.78 kg. (varies with individual projectiles).
Length of projectile: 22.5 inches.
Diameter at bourrelet: 6.0 inches (152 mm).
Distance from base to rotating band: 0.7 inch.
Width of rotating band:
  Forward: 1.2 inches.
  Space: No data.
  Aft: 1.2 inches.
Radius of ogive: 4 cal.
Filling: Cast picric acid (shimose): 5.9 pounds.
  The charge is made in two waxed-paper-wrapped preformed blocks enclosed in a cotton-flannel bag.
Fuzing: Type 13 Mk 1 Mod 1 base fuze.
Weapon in which used:
  15 cm/40 gun (bag).
  15 cm/45 gun (bag).
  15 cm/50 gun (bag).

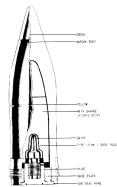


Figure 410—15-cm (Ordinary Mk 4) Common.

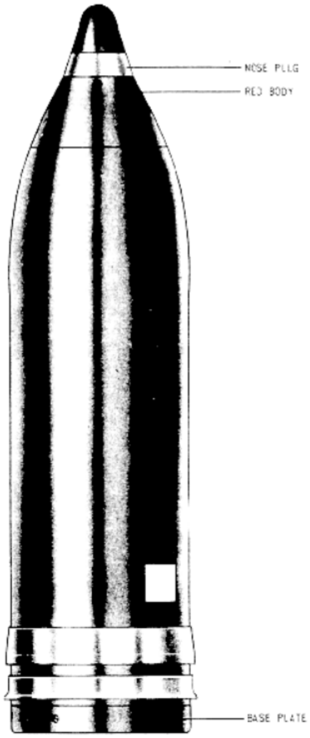


Figure 411—15-cm Incendiary Shrapnel.

15-cm (152-mm (6-inch) Incendiary-Shrapnel

Weight of filled projectile (without fuze): 98.75 pounds.
Weight of empty projectile: No data.
Weight stamped on rotating band (sample): 41.32 kg. (varies with individual projectiles).
Length of projectile (without fuze): 21.00 inches.
Diameter at bourrelet: 6.00 inches (152 mm).
Distance from base to rotating band: 0.687 inch.
Width of rotating band: 2.703 inches.
Fuzing:
- Type 91 mechanical time fuze.
- Type 88 mechanical point detonating fuzes.

Filling: No data.
Weapon in which used:
- 15 cm/40 gun (bag).
- 15 cm/45 gun (bag).
- 15 cm/50 gun (bag).

15-cm (152-mm) (6-inch) Practice Projectile

Weight of projectile, empty: No data.
Weight stamped on rotating band: 100 pounds (varies with individual projectiles).
Length of projectile: 22.47 inches.
Diameter at bourrelet: 60 inches (152 mm).
Distance from base to rotating band: 0.7 inch.
Width of rotating band:
  Forward: 1.2 inches.
  Space: No data.
  Aft: 1.2 inches.
Radius of ogive: 4 cal.
Filling:

The projectile from which this information was obtained was recovered empty.

Japanese Navy practice rounds have been recovered filled with sand and iron filings.

Weapons in which used:
  15 cm/40 gun (bag).
  15 cm/45 gun (bag).
  15 cm/50 gun (bag).

Remarks: This projectile has the same external appearance and dimensions as the Mk 4 common projectile. It differs in that the cavity is smaller and the walls are thicker.

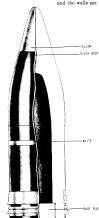


Figure 412—15-cm Practice.

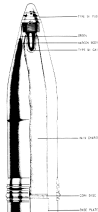


Figure 413—15.5-cm (Ordinary Type 0) High-Explosive.

(Ordinary Type 0) 15.5-cm (155-mm) (6.1-Inch) High-Explosive

Weight of filled projectile (without fuze): 119.3 pounds.
Weight of empty projectile: 112.8 pounds.
Weight stamped on rotating band (sample): 51.28 kg. (varies with individual projectile).
Length of projectile (without fuze): 23.31 inches.
Diameter at bourrelet: 6.09 inches (154.5 mm).
Distance from base to rotating band: 2.36 inches.
Width of rotating band:
  Forward: 1.26 inches.
  Space: 0.24 inch.
  Aft: 1.26 inches.
Radius of ogive: 4 cal.
Filling:
  Cast picric acid (shimose): 7.5 pounds.

The charge consists of two waxed, paper-wrapped preformed blocks with a well in the upper block to receive the gaine. The two blocks are enclosed in a cotton-flannel bag.

Fuzing: Type 88 point detonating fuzes.
Weapon in which used 15.5 cm. gun (bag).

Type 91 15.5-cm (155-mm) (6.1-Inch) Armor-Piercing

Weight of filled projectile: No data.
Weight of empty projectile: 115.92 lb.

Weight stamped on rotating band: 52.69 kg. (varies with individual projectiles).
Length of projectile: 27.09 inches.
Diameter at bourrelet: 6.08 inches (154.5 mm).
Distance from base to rotating band: 2.36 inches.
Width of rotating band:
  Forward: 1.26 inches.
  Space: No data.
  Aft: 1.26 inches.
Radius of ogive: No data.

Filling:

Trinitroanisole: 6.84 pounds.

The charge is made into one paper-wrapped preformed block with a well in the base to receive the fuze gaine. The charge is surrounded by a $\frac{5}{16}$ in. layer of cork-like plastic material which serves as a shock absorber.

Fuzing: Type 13-year Mk 1 Mod 1.
Weapon in which used: 15.5-cm. gun (bag).

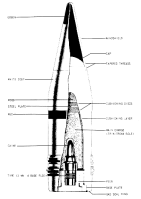


Figure 414—15.5-cm Armor-Piercing Type 91.

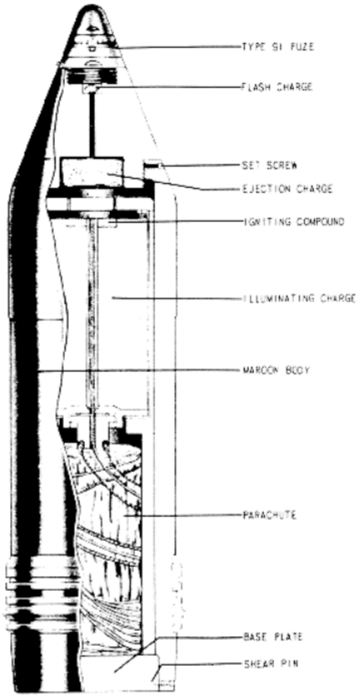


Figure 415—15.5-cm Illuminating.

15.5-cm (155-mm) (6.1-Inch) Illuminating

Weight of filled projectile (without fuze): No data.
Weight of empty projectile: 111.19 pounds.
Weight stamped on rotating band: 111.19 pounds (varies with individual projectiles).
Length of projectile (without fuze): 25.29 inches.
Diameter at bourrelet: 6.08 inches (154.5 mm).
Distance from base to rotating band: 2.36 inches.
Width of rotating band:
  Forward: 1.26 inches.
  Space: No data.
  Aft: 1.26 inches.
Radius of ogive: No data.
Filling:

A flash charge, an ejection charge (80 grams) and a thin layer of igniting composition are black powder.

The illuminating element is presumed to be the typical Japanese illuminant consisting of a mixture of barium nitrate, magnesium, and wax.

Fuzing: Type 91 mechanical time fuze.
Weapon in which used: 15.5-cm gun (bag).

Operation: The functioning of the projectile is as follows:

1. The time fuze functions, igniting the flash charge.
2. The flash charge, in turn, ignites the ejection charge, which expels from the base of the projectile the upper and lower split canisters containing, respectively, the illuminating charge and the supporting parachute.
3. Simultaneously the ejection charge ignites the illuminating charge. The burning time is 45 seconds.

20-cm/Short (202-mm) (8-Inch) Complete Round (Semifixed)

Case:
  Length: 11.0 inches.
  Diameter of base: 9.56 inches.
  Material: Brass.
  Weight (empty): 18.49 pounds.
Propellant:
  10 C3 (type 89 propellant): 4.4 pounds (2.0 kg.).

Unperforated cylindrical sticks, approximately 1 mm (1/32 inch) by 8½–9 inches, amber-colored double-base powder.

The propellant sticks are enclosed in two compartmented bags of heavy brownish silk. The inner bag contains 0.960 kg. (2.1 pounds) of propellant. The outer bag contains 1.040 kg. (2.3 pounds) of propellant.

Primer: Mk 1 case percussion primer Model 4.

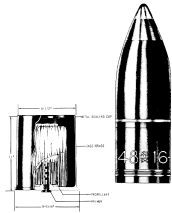


Figure 416—20-cm Short Complete Round (Semifixed).

Weapon on which used:

Short 20 cm gun.

This is a short-barreled (12 cal.) gun of low muzzle velocity and light construction on a pedestal mount designed originally for use on the light decks of merchant ships. The purpose of this weapon is to deliver a relatively heavy projectile at a limited range for antisubmarine attack and to throw up low-level antiaircraft barrage.

This gun fires semifixed ammunition; the breechblock is of the interrupted-thread type. It has been found mounted in shore emplacements.

(Ordinary Mk 1) 20-cm/Short (202-mm) (8-Inch) High-Explosive

Weight of filled projectile (without fuze): 111.0 pounds.
Weight of empty projectile: 72.50 pounds.
Weight stamped on rotating band (sample): 32.42 kg. (varies with individual projectiles).
Length of projectile (without fuze): 21.94 inches.
Diameter at bourrelet: 7.94 inches (201.5 mm).
Distance from base to rotating band: 1.0 inch.
Width of rotating band: 1.0 inch.
Filling:

Trinitroanisole (type 91 explosive): 28.50 pounds.

The charge consists of three blocks of explosive cast and sealed in a waxed paper container and sealed in the projectile with paraffin.

Fuzing:

Type 0 mechanical time fuze.
Type 88 Mod. 4 point detonating fuze.

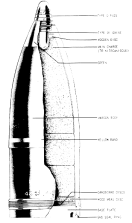


Figure 417—20-cm Short (Ordinary Mk 1) High-Explosive.

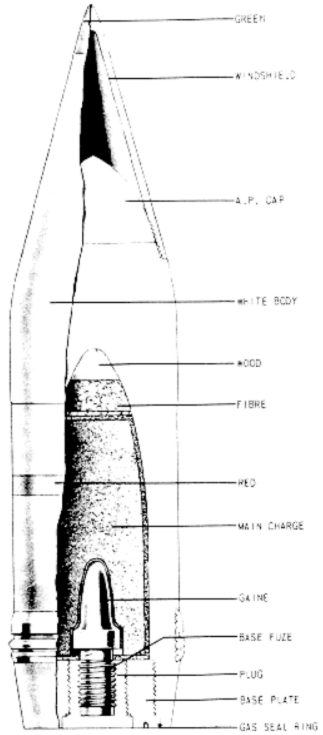


Figure 418—20-cm (Armor-Piercing Type 91) Armor-Piercing.

Type 91 20-cm (202-mm) (8-Inch) Armor-Piercing

Weight of filled projectile: 276.76 pounds.
Weight of empty projectile: 259.6 pounds.
Weight stamped on rotating band (sample): 118.8 kg. (varies with individual projectiles).
Length of projectile: 35.86 inches.
Diameter at bourrelet: 7.95 inches (202 mm).
Distance from base to rotating band: 3.11 inches.
Width of rotating band:
  Forward: 1.14 inches.
  Space: 0.26 inch.
  Aft: 1.14 inches.
Radius of ogive: No data.
Filling:
  Trinitroanisole (type 91 explosive): 17.38 pounds.

The charge consists of a preformed block of Type 91 explosive (trinitroanisole) with a well in the base to receive a gaine. The block is wrapped in waxed-paper, a 3/16-inch layer of fibrous cushioning material, and a cotton-flannel bag.

Fuzing: Type 13-year Mk 4 base fuze. Weapon in which used: Mk 2 20-cm/50 cal. dual-purpose gun.

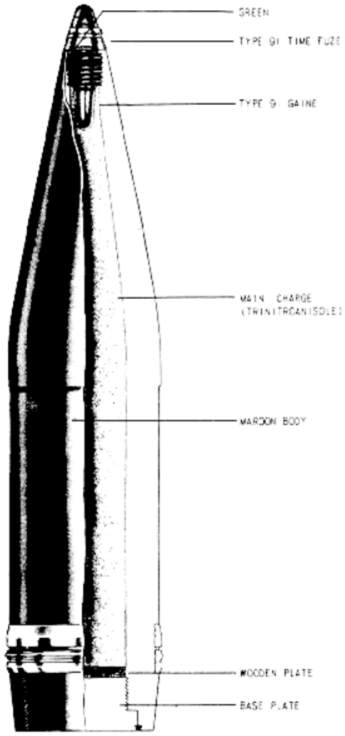


Figure 419—20-cm (Ordinary Type 0) High-Explosive.

(Ordinary Type 0) 20-cm (202-mm) (8-Inch) High-Explosive

Weight of filled projectile (without fuze): 383.14 pounds.
Weight of empty projectile: 261.8 pounds.
Weight stamped on rotating band (sample): 119.0 kg. (varies with individual projectiles).
Length of projectile (without fuze): 36.61 inches.
Diameter at bourrelet: 7.95 inches (202 mm).
Distance from base to rotating band: 3.11 inches.
Width of rotating band:
  Forward: 1.14 inches.
  Space: 0.26 inch.
  Aft: 1.14 inches.
Radius of ogive: No data.
Filling:
  Trinitroanisole (type 91 explosive): 21.34 pounds.

The charge consists of two preformed blocks of Type 91 explosive (trinitroanisole) enclosed in a cloth bag.

Fuzing:
  Type 91 mechanical time fuze.
  Type 88 point detonating fuzes.
Weapon in which used: Mk 2 20-cm/50 cal. dual-purpose gun.

20-cm (202-mm) (8-Inch) Cartridge Case (Semifixed)

Case:
  Length: 15.25 inches.
  Diameter of base: 9.58 inches.
  Material: Brass.
  Weight (empty): 18.6 pounds.
Propellant:
  10 C3 (type 89 propellant): 4.4 pounds (2.0 kg.)

Unperforated cylindrical sticks approximately 1 mm. 1/32 inch by 3½ inches, 9 inches amber-colored double-base powder. The propellant sticks are enclosed in two compartmented bags of heavy brownish silk. The inner bag contains 0.960 kg. (2.1 pounds) of propellant. The outer bag contains 1.040 kg. (2.3 pounds) of propellant.

Primer: Mk 1 case percussion primer, Mod 4.
Weapon in which used: 20-cm. type 38 coast defense gun.

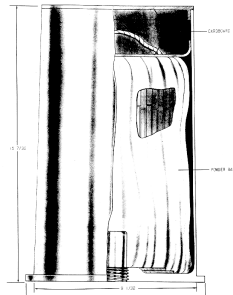


Figure 420—20-cm Cartridge Case (Semifixed).

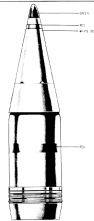


Figure 421—36-cm Armor Piercing.

36-cm (365-mm) (14-Inch) Armor-Piercing

Weight of filled projectile (without fuze): No data.

Weight of empty projectile: No data.

Weight stamped on rotating band (sample): 656.00 kg. (varies with individual projectiles).

Length of projectile (without fuze): 56.75 inches.

Diameter at bourrelet: 14.00 inches.

Distance from base to rotating band: 5.75 inches.

Width of rotating band:
- Forward: 2.00 inches.
- Aft: 1.56 inches.

Filling: Probably trinitroanisole (type 91 explosive).

Fuzing: Type 13-year Mk 4 Mod 1 base fuze.

Weapon in which used: 36-cm/45 gun (bag).

40-cm (406-mm) (16-Inch) Mk 5 Armor-Piercing

Weight of filled projectile (without fuze): No data.

Weight of empty projectile: No data.

Weight stamped on rotating band (sample): 975.00 kg. (varies with individual projectiles).

Length of projectile (without fuze): 56.50 inches.

Diameter at bourrelet: 16.00 inches.

Distance from base to rotating band: 1.97 inches.

Width of rotating band:

Forward: 2.65 inches.
Aft: 2.65 inches.

Filling: Probably trinitroanisole (type 91 explosive).

Fuzing: Type 13-year Mk 3 base fuze.

Weapon in which used: 40-cm/45 gun (bag).

Figure 422—40-cm Mk 5 Armor-Piercing.

EXPERIMENTAL

Name	Purpose	Weight of charge (kg.)	Kind of charge	Weight total (kg.)	Diam. of motor (cm.)	Diam of head (cm.)	Range (m.)	Lateral dispersion	Longitudinal dispersion
20-cm I. S. R	Barrage and A. A.	....	Incendiary bomb, shrapnel	88.9	20	20	3700	....	....
20-cm S. C. R	Antitank	....	Type 98	....	20	20	1500	....	....
18-cm S. C. R	Antitank	....	Type 98	....	10	10	1000	....	....
15-cm H. E. R	Depth charge	....	Type 91	....	15	15	3000	About 10 percent of range.	About 10 percent of range.
12-cm H. E. R	Barrage	1.63	Type 91	....	12	12	4800	About 10 percent of range.	About 10 percent of range.
10-cm H. E. R	Barrage	....	Type 98	22.5	10	10	1200	....	....
10-cm S. C. R	Antitank	1.59	Type 94	....	10	10	1200	....	....
8-cm H. E. R	Barrage	....	Type 98	9.8	8	8	1200	....	....
8-cm S. C. R	Antitank	0.53	Type 94	....	8	8	1200	....	....
2.5-cm H. E. R	Barrage	....	....	5.58	2.5	2.5	1000	....	....

H. E. R.—High-explosive rocket.
I. S. R.—Incendiary-shrapnel rocket.
S. C. R.—Shaped-charge rocket.

Chapter 5—Section 2

NAVY ROCKETS

Introduction

At the end of the war, the Japanese Navy had in production and use three rockets, a 12-cm incendiary-shrapnel, a 20-cm H. E., and a 45-cm H. E. Drawings and data of these three rockets are given in this section.

There were several other rockets in the experimental stage, and a chart listing the salient features of these rockets is also given.

ROCKET DATA

Number of nozzles	Minimum nozzle diam. (mm.)	Igniter black powder (gm.)	Fuze	Launcher	Number of grains	Outer diam. of grain (mm.)	Inner diam. of grain (mm.)	Length of grain (mm.)	When developed	Remarks
6	15.5	50	Type 5 combination, Model 1.	Experimental	7	58	10	......	November 1944.	
6	......	50	Type 5 percussion, Model 2.	Experimental	......	......	......	......	April 1945	Only experimental.
6	......	......	Type 5 percussion, Model 2.	Experimental	......	......	......	......	April 1945	Only experimental.
6	......	......	Antisubmarine fuze, Model 2.	Experimental	......	......	......	......	April 1945	Not used.
6	11.5	30	Type 5 percussion, Model 2.	Sextuple, mounted on 2 wheels.	7	35	5	360	January 1945	Used on the "Shinzo."
6	6.5	15	Type 5 percussion, Model 1.	......	7	30	5 and 10	......	......	Only experimental.
6	6.5	15	Type 5 percussion. Model 1.	Iron pipe	7	30	5 and 10	......	March 1945	Pierced armor 10-cm thick.
6	5.5	8	Type 5 percussion. Model 1.	......	7	16	9 and 5	......	......	Only experimental.
6	5.5	8	Type 5 percussion. Model 1.	Iron pipe	7	16	9 and 5	......	September 1944	Pierced armor 7-cm thick.
6	......	......	Percussion Model 4	Iron pipe	......	......	......	......	June 1944	Only experimental.

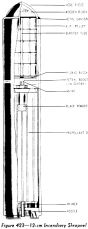


Figure 423—12-cm Incendiary Shrapnel Spin-Stabilized Rocket.

12-cm Incendiary-Shrapnel Spin-Stabilized Rocket

Assembled round:
- Weight of complete round: 51 pounds (23.18 kg.).
- Length of complete round: $28\frac{9}{16}$ inches.

Head:
- Weight of filled head: 17 pounds 9 ounces.
- Weight of filling: Picric burster charge, $4\frac{3}{4}$ ounces; incendiary cylinder filled, 10 pounds $11\frac{3}{4}$ ounces.
- Length of head: 10 inches.
- Length of incendiary cylinder: $7\frac{7}{16}$ inches.
- Diameter of head: 4.7 inches (12 cm.).

Filling:
- Picric acid burster charge: $4\frac{3}{4}$ ounces.
- Incendiary cylinder (W. P. pellets): 10 pounds $11\frac{3}{4}$ ounces.

Fuzing: Simple powder delay fuze: Powder delay train type ignited by flash from primer in base of motor.

Motor:
- Weight of filled motor: 13 pounds 11 ounces.
- Weight of propellant: 7 pounds 5 ounces (3.3 kg.).
- Length of motor: $17\frac{5}{16}$ inches.
- Diameter: 4.7 inches (12 cm).
- Six nozzles are offset 21° to the longitudinal axis of the rocket.

Warhead—motor adapter:
- Weight: 3 pounds $6\frac{3}{4}$ ounces.
- Length: $2\frac{13}{16}$ inches.
- Diameter: 4.7 inches (12 cm).

Propellant:

6 long and 1 short grains of 150 special DT6 (60 percent nitrocellulose, 29.3 percent nitroglycerine, 2.85 percent ethyl centralite and 6.14 percent mononitronaphthalene)

Long grains are 14 inches by 1.345 inches (34 mm) single perforation $\frac{5}{16}$ inch in diameter. The short grain is identical to the long grains, but shortér ($10\frac{1}{2}$ inches).

Ignition mechanism:
- Igniter: Percussion primer.
- Ignition charge: 1 ounce black powder in silk bag.

Color and markings:

Black over all. Three and one-half inches aft of nose piece is a $\frac{1}{2}$ inch yellow band. A second $\frac{1}{2}$ inch yellow band is located aft of the flange on the base plate. A label, carrying propellant data, is fixed in the motor.

Launcher:

The rocket is launched from a wooden trough mounted one on each side of the cockpit of the Jap suicide boat.

Remarks: The powder delay train type fuze used in the 12-cm. rocket allows the rocket to travel about 2,000 to 3,000 yards before the main charge is detonated.

20-cm (8-inch) High-Explosive Spin-Stabilized Rocket

Assembled round:

- Weight of complete round (with fuze): 199.95 pounds (90.7 kg.).
- Length of complete round (without fuze): 40.28 inches.

Head:

- Weight of filled head (without fuze): 110.01 pounds (49.9 kg.).
- Weight empty (body): 57.32 pounds.
- Length of head (without fuze): 23.15 inches.
- Diameter of head: 17.99 inches (203.0 mm).

Filling: Cast type 91 explosive (trinitroanisole): 38.58 pounds (17.5 kg.).

Fuzing: Type 4 rocket fuze: 1.76 pounds.

Motor:

- Weight of filled motor: 88.18 pounds (40.0 kg.).
- Weight empty (body): 43.21 pounds.
- Length of motor: 17.21 inches.
- Diameter at bearing surfaces: 7.99 inches (203.0 mm).
- Six nozzles are offset at 25° from the longitudinal axis of the motor.

Propellant:

7 grains (11.42- by 2.28- by 0.43-inches perforation) of double-base smokeless powder, weighing a total of 18.30 pounds (8.3 kg.); code designation, 240 Special DT2. Documents state that 240 DT6 may also be used.

Ignition mechanism:

- Igniter: Percussion primer.
- Ignition charge (black powder in silk pad): 50.6 grams.

Color and markings:

Maroon over all, with the nose tipped with a 2.13-inch green band. A 0.35-inch yellow band appears at the junction of the motor and projectile. Labels are located on the body (date unknown), in the nose fuze pocket (bearing explosive data), and on the forward end of the motor base plate (bearing propellant data). A serial number is stamped on the motor base.

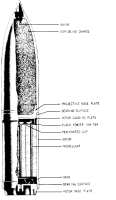


Figure 424—20-cm High-Explosive Spin-Stabilized Rocket.

Launcher:

Three signal-round launchers have been designed for this round. Two of these are trough-type, while the third is a barrel-type launcher. In addition a triple-mount trough-type launcher has been recovered.

Remarks: The head of this rocket consists of a slightly modified 20-cm projectile.

The rotating band is removed, and the round may be found with or without the rotating band groove, depending on the method of conversion.

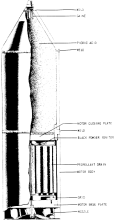


Figure 425—45-cm High-Explosive Spin-Stabilized Rocket

45-cm (17.75-Inch) High-Explosive Spin-Stabilized Rocket

Assembled round:

Weight of complete round (without fuze): 1,514 pounds (686.7 kg).

Length of complete round (without fuze): 67.5 inches.

Head:

Weight of filled head (without fuze): 942.7 pounds (427.6 kg).

Weight empty (with coupling): 443.5 pounds.

Length of head (without fuze): 40.5 inches.

Diameter of head: 17.75 inches (45 cm).

Filling:

Type 98 explosive (picric acid): 401.0 pounds (181.9 kg).

Fuzing:

Type 4 rocket fuze.

Army type 100 selective instantaneous or delay mortar fuze, with special adapter.

When the latter fuze is employed, the Navy gaine well in the charge is filled with a picric pellet, recessed for an Army gaine.

Motor:

Weight of filled motor: 571.3 pounds.

Weight empty: 269.0 pounds.

Length of motor: 27.0 inches.

Diameter at bearing surfaces: 17.75 inches (45 cm).

Six tapered nozzles are offset 18.5° from the longitudinal axis of the motor.

Propellant:

39 grains (15.25- by 2.31- by 0.41-inch perforation) of a double-base smokeless powder, weighing a total of 131.5 pounds and code 240 Special DT6.

The grains are green and red in color.

Ignition mechanism:

Igniter: Percussion primer.

Ignition charge (black powder in silk pad): 83.0 grams.

Color and markings:

Maroon over all, with a green nose.

An Arabic numeral is stenciled in white on the nose. A label, carrying propellant data, is fixed to the base of the motor.

Launcher:

A crudely manufactured, wooden, trough-type launcher has been recovered for use with this ammunition.

Remarks: A variation of this round, incorporating modified coupling and base plug, has been recovered. The nose of the modified round is threaded to receive the fuze directly, whereas the nose of the original model carried an adapter welded into place. Although the internal dimensions of the modified round are identical to the first recovered specimen, the former weighs only 1,466 pounds.

Chapter 5—Section 3

NAVY MORTARS

Type 3 81-mm High-Explosive Mortar

Weight complete round: 7.23 pounds.
Weight main charge: 1.1 pounds.
Explosive components: Main charge:

Picric 57 percent.
Alpha-nitronaphthalene 43 percent.

Over-all length (without fuze): 11.5 inches.
Length fin assembly: 3.25 inches.
Maximum diameter at bourrelet: 3.19 inches (81 mm).
Maximum diameter of tail fins: 3.18 inches.
Color and markings:

Unpainted black steel body with a green band followed by a maroon band below the fuze. This is a simulation of standard Navy marking of H. E. projectiles which typically are painted maroon over all and tipped with green.

Fuzing: Type 3 combination fuze.
Weapon in which used: Navy type 3 8-cm mortar.

Description: The body of this shell is one-piece cast-steel streamlined construction with a well machined bourrelet having five bearing surfaces. An adapter ring screws (R. H.) into the nose, but there is no booster cup as in Army types.

Screwed into the base of the shell body is the tail-fin assembly consisting of a steel tube to house the propellant cartridge and having eighteen flash ports in six rows to pass the flash from the primary cartridge to the main propelling charge. Welded around the base of the tube are a series of twelve stabilizing tail fins. The main propelling charge is contained in doughnut-shaped silk bags, which are split so that they can be slipped around the propellant tube above the tail fins and over the flash ports.

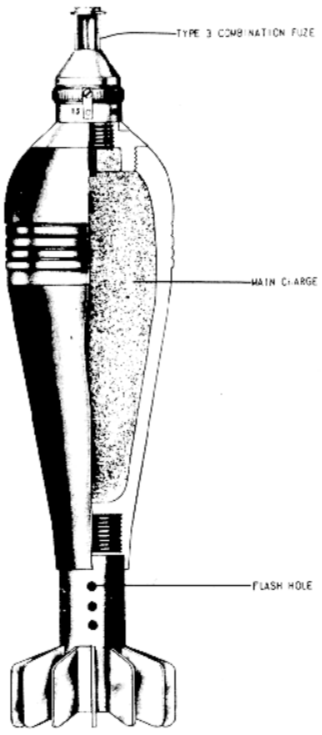


Figure 426—Type 3 81-mm High-Explosive Mortar.

Chapter 5—Section 4

NAVY PROJECTILE FUZES

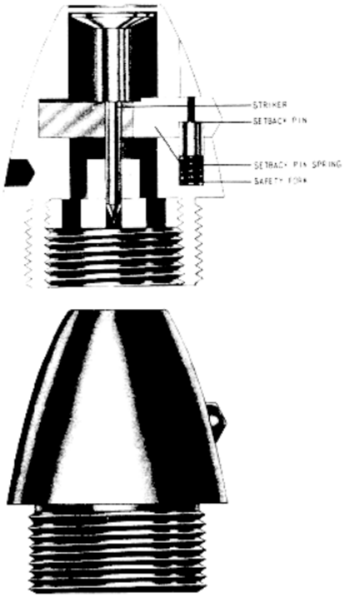


Figure 427—20-mm Model 1 Fuze.

20-mm Model 1 Fuze

Use: 20-mm projectiles.
Over-all length (with gaine): 1 9/32 inches.
Over-all length (without gaine): 3/4 inch.
Maximum diameter: 23/32 inch.
Threaded length: 3/16 inch.
Number of threads: 5.

Construction: The fuze is of one-piece construction. The striker extends from the nose of the fuze into the lower fuze body and is supported by a safety fork which is held in place by a setback pin. The gaine threads into the bottom of the fuze body.

Operation: On firing, the force of set-back causes the set-back pin to move down against its spring, thus releasing the safety fork. Centrifugal force causes the safety fork to move outward, and, when the projectile clears the bore of the gun, the safety fork is thrown clear of the projectile. This releases the striker which is driven down into the gaine on impact.

Remarks: There is a smaller version of this fuze that was originally used in the Swiss-made projectiles. It differs from the Model 1 fuze only in size.

20-mm Model 2 Impact Fuze

Use: 20-mm projectiles.
Over-all length (with gaine): 1 9/32 inches.
Over-all length (without gaine): 3/4 inch.
Maximum diameter: 2 3/32 inches.
Threaded length: 3/16 inch.
Number of threads: 5.

Construction: This is a rotor type fuze that is unique in that the firing pin instead of the detonator is housed in the rotor. The body is of two-piece construction. In the upper part of the body is a firing-pin extension. The rotor containing the firing pin is in the lower part of the body. The rotor is held in place by two centrifugal detents.

Operation: After firing, centrifugal force moves the detents out and turns the rotor until the firing pin is aligned with the firing-pin extension. The rotor is held in this position by centrifugal force, and on impact the firing-pin extension drives the firing pin into the gaine.

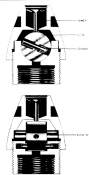


Figure 428—20-mm Model 2 Fuze.

20-mm Model 3 Impact Fuze

Use: 20-mm projectiles.
Over-all length (with gaine): $1\frac{5}{32}$ inches.
Over-all length (without gaine): $\frac{3}{4}$ inch.
Maximum diameter: $\frac{23}{32}$ inch.
Threaded length: $\frac{5}{16}$ inch.
Number of threads: 5.

Construction: There are two versions of this fuze, differing only in the fact that one is of one-piece construction and the other is of two-piece construction, having an inner metal collar threaded to the body. Threaded into the base of the fuze is a gaine, above which is an air column sealed at the top by a closing disc.

Operation: There are no arming features in this fuze. On impact, the closing disc is crushed inward, compressing the air in the column and firing the gaine.

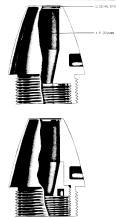


Figure 429—20-mm Model 3 Fuze.

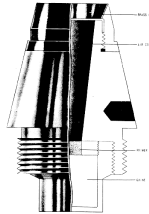


Figure 430—20-mm Two-Piece Fuze.

20-mm Two-Piece Fuze

Use: 20-mm projectiles.
Over-all length (with gaine): 1⅛ inches.
Over-all length (without gaine): 15/16 inch.
Maximum diameter: 23/32 inch.
Threaded length: 5/16 inch.
Number of threads: 5.

Construction: A black steel nose section threads onto the brass body. The top of the air column is closed by a thin brass cap held between the nose section and the fuze body. Two spanner holes are present in the fuze body.

Operation: The fuze has no safety or arming features. On impact, the nose is crushed and the compression of the air in the air column detonates the gaine.

25-mm Model 1 Fuze

Use: 25-mm H. E. projectiles.
Over-all length (with gaine): $1\frac{15}{16}$ inches.
Over-all length (without gaine): $1\frac{7}{16}$ inches.
Maximum diameter: $\frac{3}{4}$ inch.
Threaded length: $\frac{5}{16}$ inch.
Number of threads: 6 R. H.

Construction: The fuze is constructed of brass in two pieces, the upper or nosepiece threading onto the main body. The striker extends from the nosepiece into the lower fuze body and is supported by a centrifugal detent. A centrifugal flash-hole shutter separates the primer from the gaine, and the shutter housing has a shoulder on which the primer cap rests. The gaine threads into the bottom of the fuze and holds the shutter housing in place.

Operation: After firing, centrifugal force moves the detent out and also causes the flash-hole shutter to move, exposing the flash-hole. On impact, the striker is driven into the primer, which flashes into the gaine.

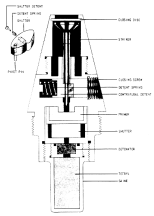


Figure 431—25-mm Model 1 Fuze.

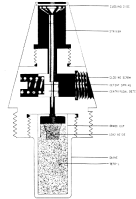


Figure 432—25-mm Model 4 Fuze.

25-mm Model 4 Fuze

Use: 25-mm H. E. projectiles.
Over-all length (with gaine): No data.
Over-all length (without gaine): 1$\frac{3}{16}$ inches.
Maximum diameter: $\frac{3}{4}$ inch.
Threaded length: $\frac{5}{16}$ inch.
Number of threads: 6 R. H.

Construction: The fuze is constructed of brass in two pieces, with the upper or nosepiece threading onto the main body. In some cases the nosepiece has been found to be made of steel. The striker extends from the nosepiece into the lower fuze body and is supported by a centrifugal detent. The gaine is threaded into the lower fuze body, with its uppermost part just below the striker point. A lead azide pellet is embedded directly below the primer in the gaine.

Operation: After firing, centrifugal force moves the detent out, arming the fuze. On impact, the striker is driven into the gaine, causing the fuze to function.

Remarks: This fuze differs from the type 1 in that its nose is more sharply pointed, the striker is longer, and the flash-hole shutter and housing are eliminated.

The type 4 fuze fits into a smaller cavity, and thus there is a larger amount of filling in the new projectiles.

30-mm Fuze

Use: 30-mm projectiles for aircraft cannon.
Over-all length (with gaine): $1\frac{3}{16}$ inches.
Over-all length (without gaine): 1 inch.
Maximum diameter: $1\frac{1}{32}$ inches.
Threaded length: $\frac{3}{16}$ inch R. H.
Number of threads: 4.

Construction: The fuze consists of the main body which houses the hammer, striker, rotor, and lower fuze body. The main body is made of aluminum, the lower fuze body and gaine of brass; the remaining parts of aluminum-magnesium mixture. The striker is carried in a rotor, which is held in the unarmed position by two centrifugal detents. The lower fuze body threads (R. H.) in the main body and is threaded (R. H.) internally to take the gaine.

Operation: Centrifugal force causes the arming detents to move out, freeing the rotor, which then turns until the striker is in line with the hammer. On impact, the hammer drives the striker into the primer, which sets off the explosive train.

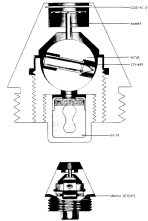


Figure 433—30-mm Fuze.

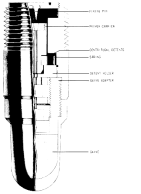


Figure 434—Type 1 Short-Delay Impact Fuze.

Type 1 Short-Delay Impact Fuze

Use: Type 1 A. P. projectiles for the 8-cm/40 Mk 2 gun
Over-all length: 3¼ inches.
Length (without gaine): 1¾ inches.
Threaded length: ¹⁵⁄₁₆ inch L. H.
Number of threads: 6.

Construction: The forward end of the fuze is externally threaded to fit into the base of the projectile nosepiece. The fixed firing pin threads into the firing pin holder, which threads into the forward end of the fuze body. The primer carrier, housed in the forward section of the fuze body, is held in the unarmed position by five detents which engage a shoulder on the primer carrier and are surrounded by a thin, flat spring. The detent holder threads into the fuze body from the after end. A flash channel is cut, longitudinally, through the primer carrier and detent holder leading to the delay pellet and explosive train. A gaine adapter, threading into the base of the fuze body, contains the delay pellet, secondary primer, and sub-booster. The explosive gaine threads onto the gaine adapter.

Operation: Centrifugal force causes the five detents to open against their spring, much like a camera diaphragm, thus freeing the primer carrier to hit the fixed firing pin on impact. The flash from the primer passes through the channel in the primer carrier and detent holder to the delay pellet and explosive train.

Remarks: This fuze is installed in the forward end of the projectile at the junction of the nose piece and the projectile body, so that no part of the fuze is visible in the assembled projectile.

Type 88 Nose Fuze

Use:

- 12-cm ordinary projectiles (semifixed).
- 12-cm ordinary projectiles (fixed).
- 12-cm incendiary, shrapnel projectiles (fixed).
- 12.7-cm ordinary projectiles (fixed).
- 12.7-cm incendiary, shrapnel projectiles (semifixed).
- 14-cm ordinary projectiles (bag).
- 15-cm ordinary projectiles (bag).
- 15.5-cm ordinary projectiles (bag).
- 20-cm ordinary projectiles (semifixed).

Over-all length (with gaine): 3⅛ inches.
Over-all length (without gaine): 5½ inches.
Maximum diameter: 2¼ inches.
Threaded length: 7/16 inch.
Number of threads: 6.

Construction: This brass fuze consists of a nose cap, fuze body, and base plug. The base plug threads into the fuze body, forming a seat for the arming-cam carrier and housing the setback plunger. The arming-cam carrier supports five arming cams, which, in turn, rest under the shoulder and supports the striker. The setback

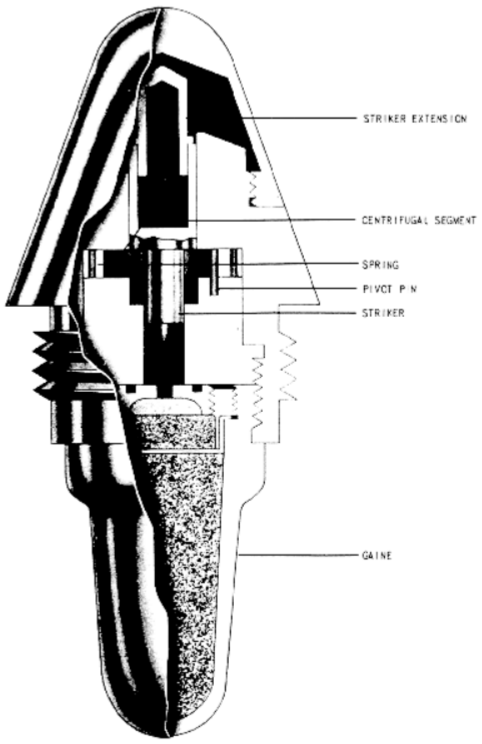


Figure 435—Type 88 and Type 88 Modification 1 Nose Fuze.

plunger is held in the forward position by a steel sleeve crimped on the after end. The head of the plunger protrudes through and above the arming-cam carrier to prevent the moving out of a master detent which locks in position the remaining detents.

The striker is a machined piece fitting into a channel in the base plug, arming-cam carrier, and fuze body. The upper end of the striker has a shoulder which rests on the arming cams and is drilled longitudinally to receive the striker extension. The inner surface of the nose cap and the top of the striker extension are beveled so as to facilitate functioning on a low angle of impact. There is a groove for a ball locking device located in the periphery of the threaded portion which threads into the projectile proper.

The gaine threads onto the after end of the base plug.

Operation: When the projectile is fired, the set-back plunger moves down into a recess in the base plug, thus freeing the arming cams, which move out from under the shoulders of the striker with centrifugal force. On impact, the nose cap is crushed, driving the striker onto the primer.

Remarks: In the type 88 Mod 1 fuze there is a safetypin which fits into a groove at the base of the set-back plunger, securing the plunger in the forward position.

Type 88 Model 2 Nose Fuze

Use:
- 12-cm ordinary projectiles (semifixed).
- 12-cm ordinary projectiles (fixed).
- 12-cm incendiary-shrapnel projectiles (fixed).
- 12.7-cm ordinary projectiles (fixed).
- 12.7-cm incendiary-shrapnel projectiles (semifixed).
- 14-cm ordinary projectiles (bag).
- 15-cm ordinary projectiles (bag).
- 15.5-cm ordinary projectiles (bag).
- 20-cm ordinary projectiles (semifixed).

Over-all length (with gaine): 3⅜ inches.
Over-all length (without gaine): 5½ inches.
Maximum diameter: 2¼ inches.
Threaded length: 7/16 inch.
Number of threads: 6.

Construction: This fuze differs from the type 88 and the type 88 modification 1 in the following respects:

1. The gaine is threaded externally to fit into the base of the fuze body.
2. There is no set-back plunger or safetypin.
3. A flat spring surrounds and holds in position the arming cams.

Operation: Centrifugal force causes the arming cams to move out against the pressure of the flat spring from under the striker shoulder. The nose cap is crushed on impact, and the striker driven against the gaine.

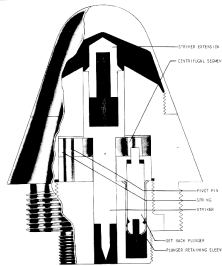


Figure 436—Type 88 Model 2 Nose Fuze.

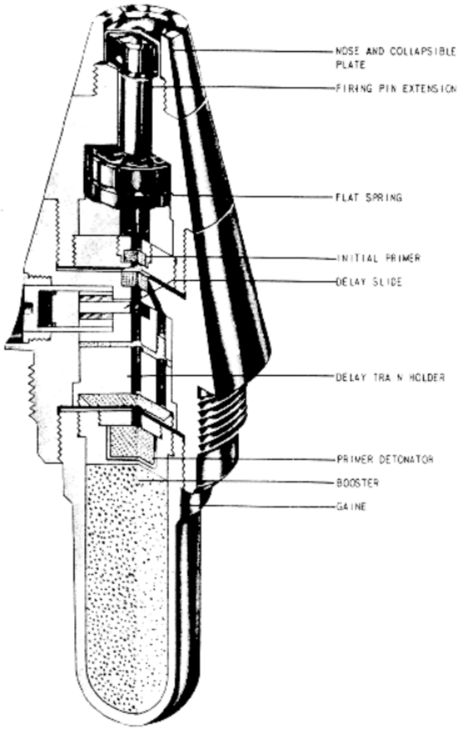


Figure 437—Type 88 Model 4 Instantaneous-Delay Fuze.

Type 88 Model 4 Instantaneous-Delay Fuze

Use: Ordinary projectiles for 12-cm and 20-cm short guns.
Over-all length (with gaine): 6⅛ inches.
Threaded length: ½ inch.
Number of threads: 6.

Construction: The fuze body is made in three sections and is fitted together with threads. The upper section houses the head of the striker. The midsection houses the remainder of the striker and the five centrifugal wedges, which rest under a shoulder of the striker and prevent contact with the primer in the unarmed position. These wedges are surrounded and held in position by a split steel band. The primer is also housed in the midsection. The lower section contains the delay element and the selector switch, which is externally controlled. The instantaneous flash channel, when the fuze is set for delay action, is closed by a small steel plate (delay slide). When set for instantaneous action, the selector switch

presents a recess allowing the delay slide, when centrifugal force sets in, to move out and free the instantaneous flash channel.

Operation: After the projectile is fired and begins to decelerate, the wedges are forced out by centrifugal force against a flat spring, thus freeing the striker. On impact, the striker is forced into the primer. The flash from the primer sets off a delay powder train, which in turn initiates the gaine. If the fuze is set for instantaneous action, the delay slide moves out with centrifugal force, leaving a flash channel to the gaine, which is initiated directly.

Remarks: The setting of 0 to 5 seconds allows the projectile to sink approximately 25 meters before detonation.

Type 4 Nose Fuze

Use: 20 cm. rocket.

Over-all length (with gaine): 5⅝ inches.

Over-all length (without gaine): 2⅞ inches.

Maximum diameter: 2¼ inches.

Threaded length: ⅝ inch.

Number of threads: 6.

Construction: The fuze is a centrifugally armed point detonating fuze constructed in two parts.

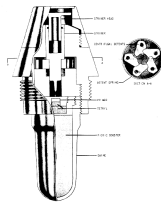


Figure 438—Type 4 Nose Fuze.

The upper body contains a copper closing disk and threads onto the lower body to form the head of the fuze. The lower body houses the striker and centrifugal detents, and is threaded to take the gaine. The lower portion of the striker has a smaller diameter forming a shoulder to bear against the detents. The upper end is hollowed to receive the striker head. The striker head has a disk on the upper end to form the striking head, and a flange to prevent its being seated too deeply in the hollowed end of the striker. The centrifugal detents are pivoted on a mounting which threads into the base of the lower body above the gaine. A spring band holds them under the striker shoulder. The detents are so arranged that they can only move out in sequence to release the striker.

The gaine threads into the lower fuze body.

Operation: Rotation of the rocket in flight causes the centrifugal detent to move out against the detent spring so as to clear the shoulder of the striker. Impact crushes the fuze head and drives the striker down into the gaine.

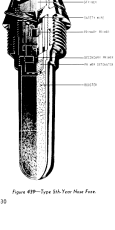


Figure 439—Type 5th-Year Nose Fuze.

Type 5th-Yr. Nose Fuze

Use:
  8-cm ordinary projectiles (fixed and semifixed).
  12-cm ordinary projectiles (semifixed).
  14-cm ordinary projectiles (bag).
Over-all length (with gaine): 5¼ inches.
Over-all length (without gaine): 1¹⁵⁄₁₆ inches.
Maximum diameter: 1¾ inches.
Threaded length: ¾ inch.
Number of threads: 9 R. H.

Construction: The fuze body is of two-piece brass construction, with the upper part, or nose cap, threading (R. H.) onto the lower part. The lower portion is threaded (L. H.) internally to take the gaine. The gaine is made of light steel. A heavy striker fits against the interior top of the nosepiece, which is beveled to facilitate functioning with a low angle of impact. The lower fuze body contains a primary primer and a secondary striker.

Operation: On impact, the nose cap is sheared off or crushed, forcing the first striker into the first primer. This explosion forces the secondary striker down, shearing the shear pin and causing the gaine to function.

40-mm Powder Time Fuze

Use: 40-mm A. A. projectiles.
Over-all length (with gaine): 3⅝ inches.
Over-all length (without gaine): 2³⁄₃₂ inches.
Maximum diameter: 1⁷⁄₃₂ inches.
Threaded length: ¾ inches.
Number of threads: 6 R. H.

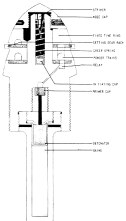


Figure 440—40-mm Powder Time Fuze.

Construction: The fuze body, gaine, magazine carrier, and nose cap are made of aluminum. The two time rings are made of brass. A hollow spindle protrudes up from the fuze body, over which are fitted the lower (movable) and upper (fixed) time rings. The nose cap threads onto this extension and holds the upper time ring in place. Housed within the hollow spindle are the striker, creep spring, and initiating cap or primer. Halfway up the side of the hollow spindle is a flash port leading to the upper time train. There is a tooth rack machined around the upper edge of the lower time ring for automatic setting.

The gaine threads into the lower end of the fuze body.

Operation: As the round feeds into the gun, a rack engages the teeth of the lower time ring, which is rotated about its axis by the meshing of these gears, setting the fuze. When the gun is fired, the force of set-back causes the striker to pierce the primer. The flash from the primer passes to the upper time ring, and in turn, to the lower. The flash from the lower time ring sets off the relay pellet and the black powder, which flashes down to the gaine.

Type 3 Aerial-Burst—Impact Mortar Fuze

Use: 8-cm mortar ammunition.
Over-all length (with gaine): 3¾ inches.
Over-all length (without gaine): 2¼ inches.
Maximum diameter: $1\frac{11}{32}$ inches.
Threaded length: ½ inch.
Number of threads: 7 R. H.

Construction: This fuze is made of a three-piece black steel or brass body. Protruding from the nosepiece is the primary, or impact, striker which houses the secondary or aerial-burst striker. A metal safety clip fits around and holds the striker from the primary primer. The secondary striker within the shaft of the primary striker is held from the aerial-burst primer by a small coiled spring. Housed in the lower end of the primary striker is an aerial-burst primer and a short delay

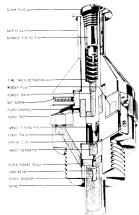


Figure 441—Type 3 Aerial-Burst-Impact Mortar Fuze.

train leading to a black-powder collar which fits around the lower circumference of the primary striker. The explosive train from this collar leads through ports in the midsection of the fuze to the powder time train housed in the midsection. The midsection is movable and may be set for impact firing or aerial burst (2 to 22 seconds).

In the lower fuze section there is one explosive-filled channel, the upper end of which contacts the powder time ring, and the lower end leads to the explosive gaine.

Operation: For aerial-burst firing, the time ring is set and the safety clip removed. On set-back, the secondary striker initiates the aerial-burst primer, which in turn burns through the powder time train to the explosive gaine. If impact occurs prior to the lapse of the time set, the primary striker will be driven onto the primary primer. The delay-arming (black) powder collar around the primary striker is designed to allow firing the mortar from a concealed position through underbrush and gives a definite bore safety.

30-Second Powder Time Fuze

Use: 12-cm illuminating projectile.
Over-all length: 2¾ inches.
Maximum diameter: 2⅝ inches.
Threaded length: ½ inch.
Number of threads: 3 R.H.

Construction: The fuze is built with a brass nose piece, an aluminum midsection, a fixed and movable powder ring, and a brass base section which houses a black-powder magazine in the rear end and supports a central spindle which houses the fixed firing pin. The spindle and base section are made in one piece. The nose piece is a hollow truncated cone containing four vent holes forward and threaded (R. H.) internally, rear, to

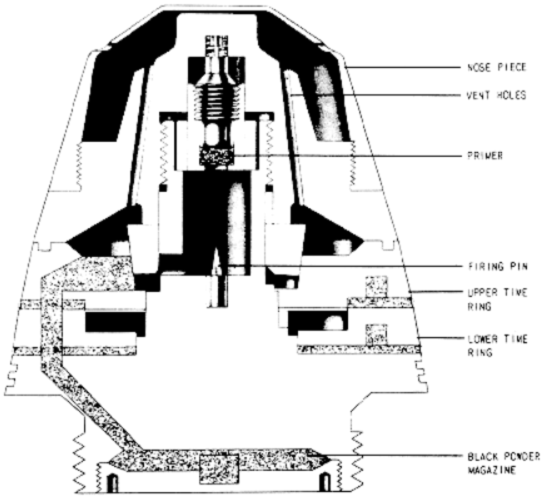


Figure 442—30-Second Powder Time Fuze.

fit the forward end of the aluminum midsection. The aluminum midsection has four vents forward and a threaded (R. H.) opening located centrally. At the rear of the threaded opening, the aluminum piece has a longitudinal recess to take a small coiled spring whose purpose is to prevent the freezing of the movable primer carrier, which is partially housed in the aluminum midsection. A narrow lip around the base circumference of the midsection fits into a groove on the upper surface of the fixed (upper) time ring and forms a seal. The rear end of the movable primer carrier is housed in the forward end of the spindle. The primer carrier is made of a small brass cylinder, into the top of which is threaded a small weight. The primer is carried in the lower part of the carrier and rests on an internal lip. Surrounding the cylinder and secured by a tight friction fit, is a split brass collar which rests upon an internal shoulder in the upper end of the spindle. The movable (lower) time ring has the time settings (0 to 30 seconds) in increments of $\frac{1}{5}$ second. A segmented brass friction washer is keyed to the spindle and holds the fixed time ring in position.

Operation: Upon firing, set-back causes the primer carrier to move down out of the split collar and onto the firing pin. The flash ignites the black-powder delay in the upper time ring, and after the set delay period the black powder magazine is ignited.

Type 91 Mechanical Time Fuze

Use:
- 12-cm ordinary projectiles (semifixed).
- 12-cm ordinary projectiles (fixed).
- 12-cm incendiary-shrapnel projectiles (fixed).
- 12.7-cm ordinary projectiles (fixed).
- 12.7-cm incendiary-shrapnel (fixed).
- 14-cm illuminating projectiles (bag).
- 15-cm illuminating projectiles (bag).
- 15.5-cm illuminating projectiles (bag)

Over-all length: $2\frac{15}{16}$ inches.
Maximum diameter: $2\frac{9}{32}$ inches.
Threaded length: $\frac{1}{2}$ inch.
Number of threads: 6.

Construction: Type 91, the fuze body consists of an aluminum nose cap, and a nickel-plated brass time-setting ring, locking ring, and base section. Housed in the nose cap is a spring-supported set-back hammer. Immediately below the set-back hammer is a spring-driven clock mechanism identical in construction to those in Japanese bomb fuzes D–2 (a), D–2 (b) and D–2 (c). However, this fuze is started by set-back and maintained in the armed position by centrifugal force. The time-setting ring has a vertical opening on its top rim by which the clock may be wound with an appropriate tool after the nose cap has been removed. There are two exterior setting lugs. One is secured to the time ring and the other to the lower portion of the fuze body. The time-setting ring is graduated in one-second intervals from 0 to 55 seconds.

Operation: Before firing the gun, the setting disk is connected to the time setting ring of the fuze by the control arm. It is not connected to the clockwork, but is free to rotate around the clockwork spindle when the time-setting ring of the fuze is moved in the setting. Setting of the fuze varies the distance the setting disk must be rotated by the clockwork before the striker release arm will fall into the slot in the setting disk and release the striker.

Until the gun is fired, the clockwork is held immobile by the escapement release arm connected to a vertical shaft. A torsion spring working on the shaft tends to rotate the escapement release arm away from the clockwork gears. It is prevented from doing this by a projection on the upper end of the vertical shaft which bears against a shoulder of the clock-starting plunger.

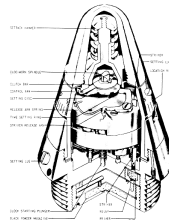


Figure 443—Type 91 Mechanical Time Fuze.

When the gun is fired, the set-back hammer is left behind with sufficient force to:

1. Bend the control arm out of engagement with the time setting ring.
2. Drive the clutch bar down into a slot in the upper end of the clock—thus spreading it sufficiently to clutch the setting disk to the clockwork spindle. At the same time, the clock-starting plunger is left behind by setback and thereby removes the shoulder from in front of the extension of the escapement release-arm shaft, allowing the escapement release arm to be rotated free of the clockwork gears. The clockwork is now free to run and starts to rotate the setting disk in a counterclockwise direction. With centrifugal force, a centrifugal safety lock is thrown out from below a shoulder of the striker, which is now free to be released.

When the clock-starting plunger moves downward, its upper end is removed from the outer end of the striker release arm, which is now free to move outward under the impulse of the striker release-arm spring, and its inner end then bears against the setting disk. When the setting disk

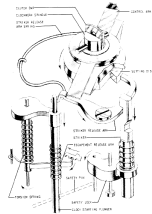


Figure 444—Type 91 Mechanical Time Fuze.

is rotated sufficiently to bring the notch into alignment with the inner end of the striker release arm, the striker release arm spring forces the outer end of the release arm out, thereby pivoting the inner end into the slot of the setting disk. When this happens, the striker release arm moves out of its notch in the striker, which is then driven downward onto the primer cap, initiating the detonation of the projectile via the medium of the auxiliary fuze.

Remarks: There is a modified version of this fuze that has a gear ring for automatic setting. This is used in the 12.7-cm ammunition for the 12.7-cm A. A. gun which has an automatic time-setting device.

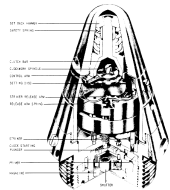


Figure 445—Type 0 Mechanical Time Fuze.

Type 0 Mechanical Time Fuze

Use: Ordinary projectiles for the 12-cm and 20-cm short guns.
Over-all length: $2\frac{13}{16}$ inches.
Maximum diameter: $2\frac{9}{32}$ inches.
Threaded length: $\frac{1}{2}$ inch.
Number of threads: 6.

Construction: This fuze is the same as the type 91 Mod 1, except that it has a weaker set-back spring and has a flash shutter in the basal portion. It is distinguished from the type 91 Mod 1 by a red nosepiece.

Operation: The operation is the same as the type 91 Mod 1, with the addition of the centrifugal flash shutter in the base, which swings back under centrifugal force, thus opening up the firing train.

Type 98 Mechanical Time Fuze

Use: 10-cm ordinary (fixed).
Over-all length: $4\frac{15}{16}$ inches.
Maximum diameter: $2\frac{13}{16}$ inches.
Threaded length: $\frac{1}{2}$ inch.

Construction: This fuze is similar to the type 91 Mod 1, but is longer in order to conform to the ogive of the projectiles it is used in. It incorporates the automatic gear setting ring and flash shutter in the basal portion that is found in the type 0 fuze. It is graduated from 0–45 seconds in increments of 1 second.

Operation: The operation is identical to the type 0 fuze.

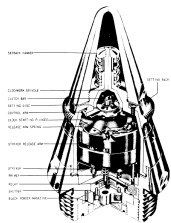


Figure 446—Type 98 Mechanical Time Fuze.

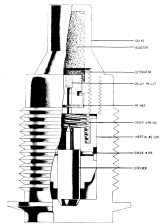


Figure 447—40-mm Base Fuze.

40-mm Base Fuze

Use: 40-mm A. P.–H. E. projectiles.
Over-all length (with gaine): $2\frac{5}{32}$ inches.
Over-all length (without gaine): $1\frac{1}{4}$ inches.
Maximum diameter: $1\frac{7}{32}$ inches.
Threaded length: $\frac{3}{4}$ inch L. H.

Construction: A cylindrical steel piece is threaded externally and centrally drilled to provide a recess to house and guide the striker, inertia weight, and creep spring. It is threaded internally on the forward end to take the gaine. The striker is housed in and secured to the inertia weight by a copper shear pin. The inertia weight is a steel cylinder which closely fits the inner opening of the fuze body and is held in the rearmost position by a creep spring resting between the explosive-train carrier and an annular groove in the forward end of the inertia weight.

Operation: On firing, set-back causes the inertia weight to move downward, breaking the shear wire and exposing the striker. Upon impact, the striker and collar move against the creep spring and the firing pin pierces the primer.

5-cm Base Fuze

Use: 5-cm. H. E. projectiles.
Over-all length: 1 5/16 inches.
Diameter of threaded portion: 13/32 inch.

Construction: The fuze consists of a steel cylinder externally threaded and drilled internally to take a soft metal block in which the striker is friction-fitted. The striker is a steel pin. The end of the fuze is closed by the primer holder.

Operation: Before firing, the striker rests against the base of the fuze and cannot pierce the primer, since the striker block has a concave surface on the forward end. On set-back, the striker block moves back and leaves the striker protruding. On impact, both the striker and striker block move forward with the striker, hitting the primer.

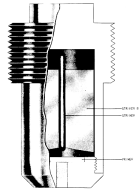


Figure 448—5-cm Base Fuze.

Type 3d-Year Mk 1 Base Impact Fuze

Use: 12-cm. ordinary projectiles (semifixed).
Over-all length (with gaine): $5\frac{5}{16}$ inches.
Over-all length (without gaine): $3\frac{1}{2}$ inches.
Maximum diameter: $1\frac{9}{16}$ inches.
Threaded length: $1\frac{5}{16}$ inches.
Number of threads: 12.

Construction: Excepting the set-back plunger and gaine, this fuze is constructed entirely of brass and made of two pieces. The base of the rear portion contains an oblong slot into which the rear end of the threaded spindle and/or striker is fitted. On the threads of the striker rides an inertia weight which is free to revolve about the striker except for a set-back plunger which, in the unarmed position, rests partially in a recess in the inertia weight and partially in a stationary collar in the fuze body, thus preventing any revolution of the inertia weight. This inertia weight prevents the striker from falling onto the primer of the gaine. The forward end of the striker fits down through an inner collar, which is a part of the forward section of the fuze. Immediately before the threaded portion of the striker is a split collar which is wedged between the threads and the inner collar, affording an additional safety feature.

Operation: On set-back, the flanged inertia plunger moves back into the recess of the inertia weight. Since the striker is keyed to the fuze and thus spins with the fuze, the inertia weight lags behind and moves back to the base of the fuze. The force of impact causes the striker to move forward, overcoming the split brass collar, onto the primer.

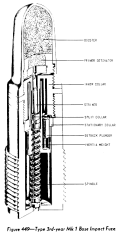


Figure 449—Type 3rd-year Mk 1 Base Impact Fuze.

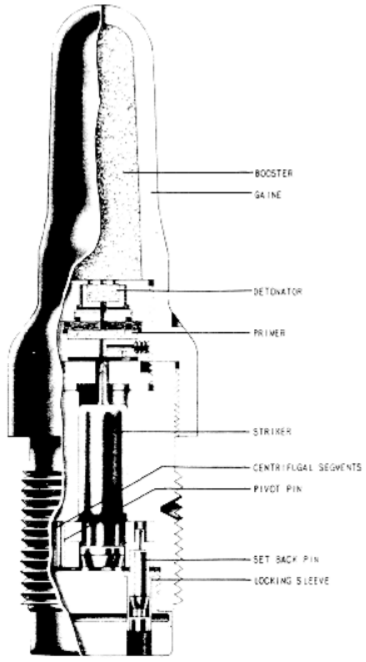


Figure 450—Type 13th-year Mk 1 Mod 1 Base Fuze.

Type 13th-Year Mk 1 Mod 1 Base Impact Fuze

Use: 14 and 15 cm. common projectiles.
Over-all length (without fuze carrier): 5 7/16 inches.
Length of fuze body (without Gaine): 3 1/8 inches.
Maximum diameter (with fuze): 1 7/8 inches.
Threaded length: 1 7/16 inches.
Number of threads: 13.

Construction: This fuze is threaded externally on the foward end to fit the large explosive gaine and externally on the after end to fit into the base-fuze carrier. Both the gaine and the base-fuze carrier are secured to the fuze by a grub screw. The fuze is bored to two diameters longitudinally. The after and larger diameter accommodates the arming mechanism and the head of the striker; the foward diameter forms a friction fit with the main body of the striker. The arming mechanism is housed in a metal block (fuze base) which threads into the after end of the fuze and is secured by a lock bolt. On the foward end of this block is an arming cam carrier supporting five interlocking arming cams, pivoted separately, which, in the unarmed position, rest in a circumferential groove in the striker and hold the striker from the primer. A set-back plunger rests in a recess in the fuze base and is supported by the fingers of a metal sleeve. The forward end of the set-back plunger protrudes through the arming-cam carrier to prevent the movement of the master arming cam with which the remaining arming cams interlock. A safetypin holds the set-back plunger in the forward position before the fuze is installed into the projectile.

The gaine contains the primer, delay train, and booster. A thin cardboard disk is placed over the primer to prevent the striker from prematurely piercing the primer as a result of creep.

Operation: On set-back the set-back plunger moves back and is held by the fingers of a metal sleeve. The arming cams move out with centrifugal force, freeing the striker to move down onto the primer on impact.

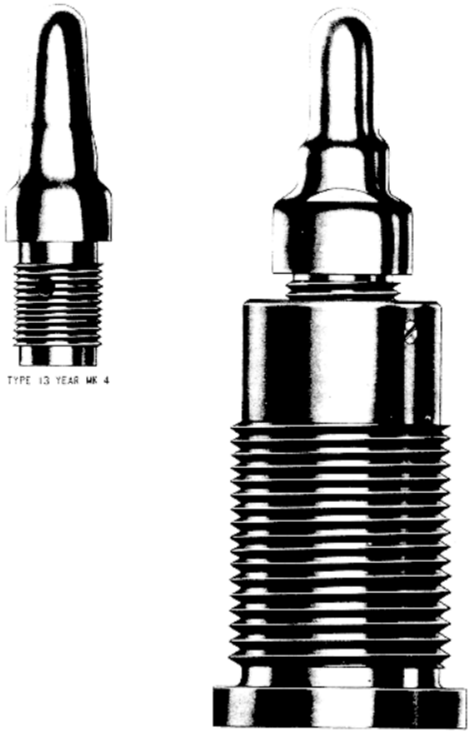


Figure 451—Type 13-Year Mk 4 and Mk 4 Mod 1 Base Fuzes.

Type 13th-Year Mk 4 and Mk 4 Mod 1 Base Fuzes

Use:

Type 13th-year Mk 4 20-cm type 91 A. P.
Type 13th-year Mk 4 Mod 1 36-cm. A. P.

	Mk 4	Mk 4 Mod 1
Over-all length (with gaine).	$6\frac{3}{8}$ inches	$6\frac{7}{8}$ inches.
Threaded length	$1\frac{19}{64}$ inches	$1\frac{7}{16}$ inches.
Number of threads	13	13.

Construction: The design of these fuzes is almost identical to the type 13-year Mk 1 Mod 1 fuze, differing only in size and minor body features. The gaine, however, is of different construction than that used in the Mk 1 fuze. It contains a primer delay, relay, initiator, and booster.

Operation: The operation of this fuze is the same as the type 13-year Mk 1 Mod 1.

REFERENCE TABLE 1

INCHES TO MILLIMETERS

Basis: 1 inch = 25.4 Millimeters

Inches	Millimeter	Inches	Millimeter	Inches	Millimeter	Inches	Millimeter
1	25.4	26	660.4	51	1,295.4	76	1,930.4
2	50.8	27	685.8	52	1,320.8	77	1,955.8
3	76.2	28	711.2	53	1,346.2	78	1,981.2
4	01.6	29	736.6	54	1,371.6	79	2,006.6
5	127.0	30	762.0	55	1,397.0	80	2,032.0
6	152.4	31	787.4	56	1,422.4	81	2,057.4
7	177.8	32	812.8	67	1,447.8	82	2,082.8
8	203.2	33	838.2	58	1,473.2	83	2,108.2
9	228.6	34	863.6	59	1,498.6	84	2,133.6
10	254.0	35	889.0	50	1,524.0	85	2,159.0
11	279.4	36	914.4	61	1,549.4	86	2,184.4
12	304.8	37	939.8	62	1,574.8	87	2,209.8
13	330.2	38	965.2	63	1,600.2	88	2,235.2
14	355.6	39	990.6	64	1,625.6	89	2,260.6
15	381.0	40	1,016.0	65	1,651.0	90	2,286.0
16	406.4	41	1,041.4	66	1,676.4	91	2,311.4
17	431.8	42	1,066.8	67	1,701.8	92	2,336.8
18	457.2	43	1,092.2	68	1,727.2	93	2,362.2
19	482.6	44	1,117.6	69	1,752.6	94	2,387.6
20	508.0	45	1,143.0	70	1,778.0	95	2,413.0
21	533.4	46	1,168.4	71	1,803.4	96	2,438.4
22	558.8	47	1,193.8	72	1,828.8	97	2,463.8
23	584.2	48	1,219.2	73	1,854.2	98	2,489.2
24	609.6	49	1,244.6	74	1,879.6	99	2,514.6
25	635.0	50	1,270.0	75	1,905.0	100	2,540.0

REFERENCE TABLE 2

MILLIMETERS TO INCHES

Basis: 1 inch=25.4 Millimeters

Millimeter	Inch	Millimeter	Inches	Millimeter	Inches	Millimeter	Inches
1....	0. 03937	26....	1. 023622	51....	2. 007874	76....	2. 992126
2....	. 078740	27....	1. 062992	52....	2. 047244	77....	3. 031496
3....	. 118110	28....	1. 102362	53....	2. 086614	78....	3. 070866
4....	. 157480	29....	1. 141732	54....	2. 125984	79....	3. 110236
5....	. 196850	30....	1. 181102	55....	2. 165354	80....	3. 149606
6....	. 236220	31....	1. 220472	56....	2. 204724	81....	3. 188976
7....	. 275591	32....	1. 259843	57....	2. 244094	82....	3. 228346
8....	. 314961	33....	1. 299213	58....	2. 283465	83....	3. 267717
9....	. 354331	34....	1. 338583	59....	2. 322835	84....	3. 307087
10....	. 393701	35....	1. 377953	60....	2. 362205	85....	3. 346457
11....	. 433071	36....	1. 417323	61....	2. 401575	86....	3. 385827
12....	. 472441	37....	1. 456693	62....	2. 440945	87....	3. 425197
13....	. 511811	38....	1. 496063	63....	2. 480315	88....	3. 464567
14....	. 551181	39....	1. 535433	64....	2. 519685	89....	3. 503937
15....	. 590551	40....	1. 574803	65....	2. 559055	90....	3. 543307
16....	. 629921	41....	1. 614173	66....	2. 598425	91....	3. 582677
17....	. 669291	42....	1. 653543	67....	2. 637795	92....	3. 622047
18....	. 708661	43....	1. 692913	68....	2. 677165	93....	3. 661417
19....	. 748031	44....	1. 732283	69....	2. 716535	94....	3. 700787
20....	. 787402	45....	1. 771654	70....	2. 755906	95....	3. 740157
21....	. 826772	46....	1. 811024	71....	2. 795276	96....	3. 779528
22....	. 866142	47....	1. 850394	72....	2. 834646	97....	3. 818898
23....	. 905512	48....	1. 889764	73....	2. 874016	98....	3. 858268
24....	. 944882	49....	1. 929134	74....	2. 913386	99....	3. 897638
25....	. 984252	50....	1. 968504	75....	2. 952756	100...	3. 937008

REFERENCE TABLE 3

BINARY FRACTIONS OF AN INCH TO DECIMAL INCHES AND MILLIMETERS

Fractions						Decimal	Millimeters
					1/64	0.105625	0.396875
				1/32		.031250	.793750
					3/64	.046875	1.190625
			1/16			.062500	1.587500
					5/64	.078125	1.984375
				3/32		.093750	2.381250
					7/64	.109375	2.778125
		1/8				.125000	3.175000
					9/64	.140625	3.571875
				5/32		.156250	3.968750
					11/64	.171875	4.365625
			3/16			.187500	4.762500
					13/64	.203125	5.159375
				7/32		.218750	5.556250
					15/64	.234375	5.953125
	1/4					.250000	6.350000
					17/64	.265625	6.746875
				9/32		.281250	7.143750
					19/64	.296875	7.540625
			5/16			.312500	7.937500
					21/64	.328125	8.334375
				11/32		.343750	8.731250
					23/64	.359375	9.128125
		3/8				.375000	9.525000
					25/64	.390625	9.921875
				13/32		.406250	10.318750
					27/64	.421875	10.715625
			7/16			.437500	11.112500
					29/64	.453125	11.509375
				15/32		.468750	11.906250
					31/64	.484375	12.303125
1/2						.500000	12.700000
					33/64	.515625	13.096875
				17/32		.531250	13.493750
					35/64	.546875	13.890625
			9/16			.562500	14.287500

REFERENCE TABLE 3—*Continued*

BINARY FRACTIONS OF AN INCH TO DECIMAL INCHES AND MILLIMETERS

Fraction	Decimal	Millimeter
1/64	.015625	0.396875
3/64	.046875	1.190625
5/64	.078125	1.984375
7/64	.109375	2.778125
1/32	.125000	3.175000
9/64	.140625	3.571875
5/32	.156250	3.968750
11/64	.171875	4.365625
3/16	.187500	4.762500
13/64	.203125	5.159375
7/32	.218750	5.556250
15/64	.234375	5.953125
1/4	.250000	6.350000
17/64	.265625	6.746875
9/32	.281250	7.143750
19/64	.296875	7.540625
5/16	.312500	7.937500
21/64	.328125	8.334375
11/32	.343750	8.731250
23/64	.359375	9.128125
3/8	.375000	9.525000
25/64	.390625	9.921875
13/32	.406250	10.318750
27/64	.421875	10.715625
7/16	.437500	11.112500
29/64	.453125	11.509375
15/32	.468750	11.906250
31/64	.484375	12.303125
1/2	.500000	12.700000
33/64	.515625	13.096875
17/32	.531250	13.493750
35/64	.546875	13.890625
9/16	.562500	14.287500
37/64	.578125	14.684375
19/32	.593750	15.081250
39/64	.609375	15.478125
5/8	.625000	15.875000
41/64	.640625	16.271875
21/32	.656250	16.668750
43/64	.671875	17.065625
11/16	.687500	17.462500
45/64	.703125	17.859375
23/32	.718750	18.256250
47/64	.734375	18.653125
3/4	.750000	19.050000
49/64	.765625	19.446875
25/32	.781250	19.843750
51/64	.796875	20.240625
13/16	.812500	20.637500
53/64	.828125	21.034375
27/32	.843750	21.431250
55/64	.859375	21.828125
7/8	.875000	22.225000
57/64	.890625	22.621875
29/32	.906250	23.018750
59/64	.921875	23.415625
15/16	.937500	23.812500
61/64	.953125	24.209375
31/32	.968750	24.606250
63/64	.984375	25.003125
1	1.000000	25.400000

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